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The Korting Exhaust Steam Induction Condenser.

We present with this an engraving of a new form of condenser for steam engines, also engravings representing its application under various conditions. This condenser belongs to that class of injectors or ejector condensers in which a vacuum is formed in the cylinder of a steam engine without the use of an air-pump or other mechanism in motion, but differs from others of its class in this feature: It provides for its own water supply whether it is required to lift it by suction, as from a well or reservoir, or as in its application to a marine engine from the water level, or whether the water flows to it under high or low pressure, as from service pipes in which the pressure may be fluctuating, or from other sources where a pressure of greater or less degree exists. It is also immaterial whether the discharge be at a point immediately, or at any convenient distance, below the condenser, or whether the discharge is directly into the atmosphere or below the surface of the water.

It will be seen that these features permit the placing of the condenser in any desired position, without reference to the head of water, or to the point at which the water is to be discharged; that no pump is required to elevate the water under any ordinary circumstances, and that the condenser may be used under circumstances where it has not been convenient or possible to use such condensing apparatus heretofore.

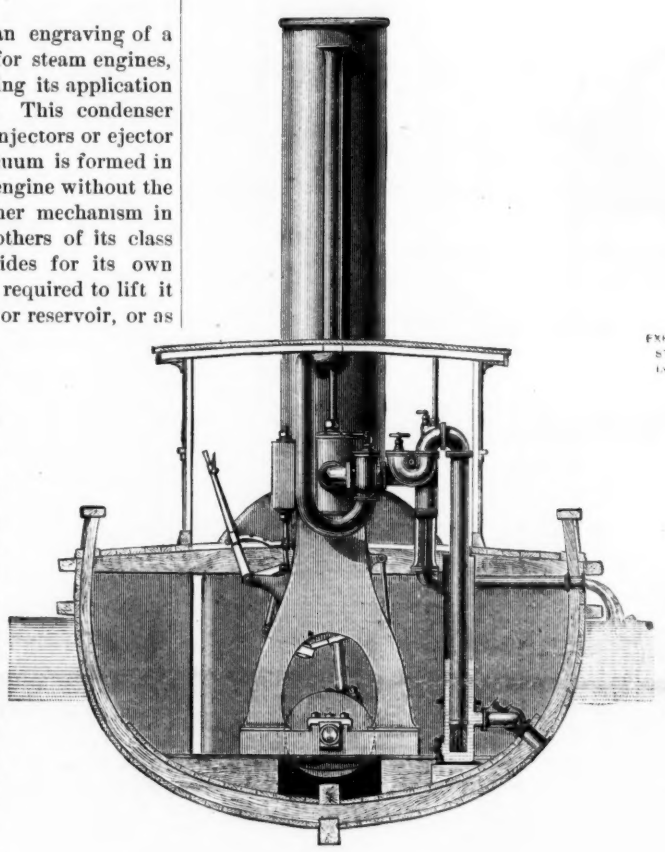


FIG. 3.

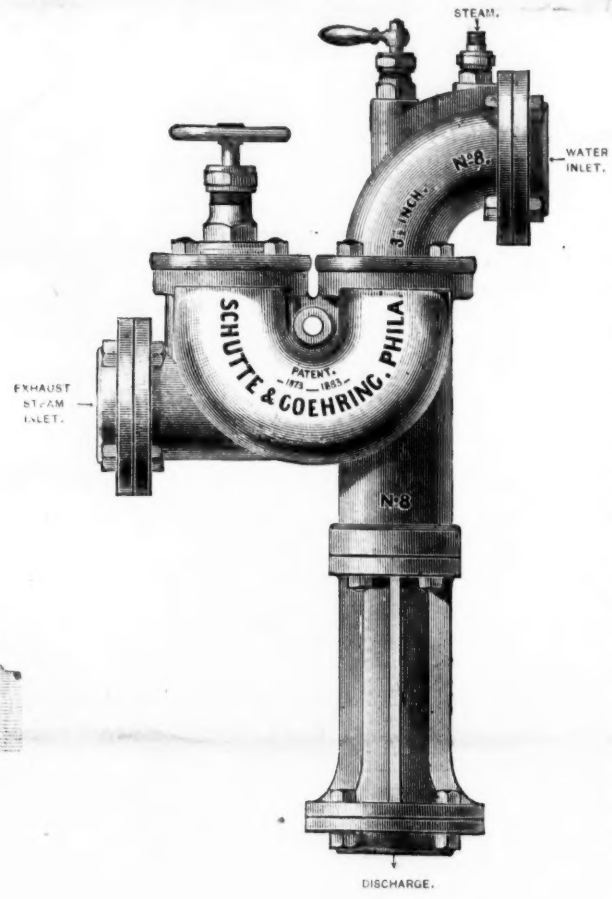


FIG. 1.

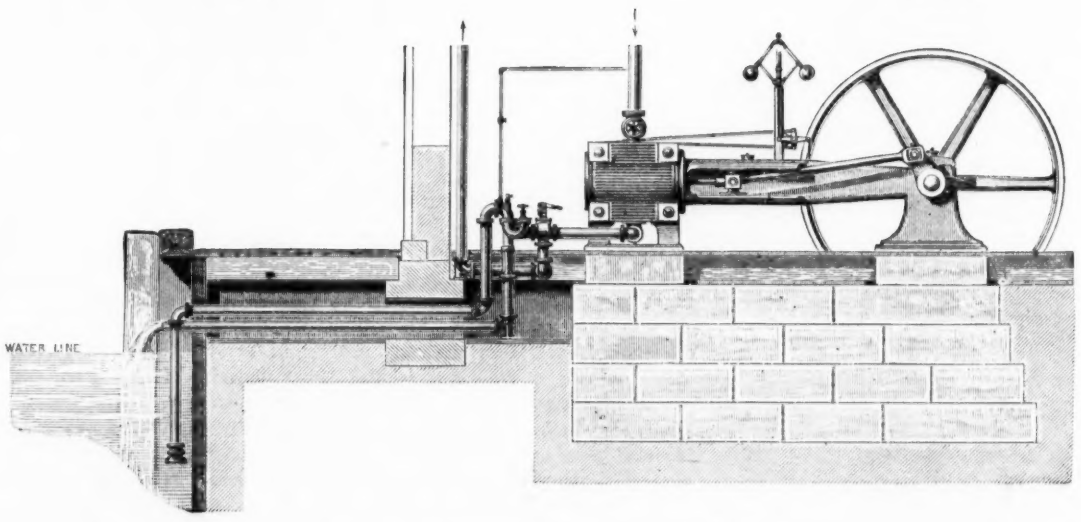


FIG. 2.—KORTING INDUCTION CONDENSER.

Referring to the engravings, Fig. 1 represents the condenser complete, ready for attachment, the course of the exhaust steam and the water being indicated. The purpose of the small steam inlet at the top, and the governing handle near by, will be referred to in connection with the special application of the condenser.

In Fig. 2, the condenser is represented arranged for use with a stationary steam engine. It is here conveniently situated above the floor, taking its water by suction and delivering it into the atmosphere. The pipe, which is only $\frac{1}{8}$ the diameter of the water supply, from the main steam pipe of the engine leads to the small steam inlet previously referred to. As before intimated the location of the condenser might be at any other point, either above or below the floor, if more convenient.

Fig. 3 represents a convenient attachment of the condenser to a tug-boat or marine engine, the engraving in itself being sufficiently explanatory.

As represented in Fig. 4, (page 2) the supply of water is from above, regulated in quantity by the valve *K*. Below *A*, is a check valve, which forms part of the condenser proper. This valve is for the purpose of preventing the possibility of flooding the cylinder with water, thereby causing serious accident. If from any cause a current should be induced *towards* the cylinder, this check valve instantly closes, thereby arresting its progress in that direction. Although this is not likely to occur, experience has shown that the possibility of its occurrence should always be provided for. This discharge is seen to be carried down from the bottom of the condenser, which while it is generally a matter of convenience, is, further than this, of no especial consequence. At *B*, is shown a free exhaust valve. This is by no means a part of the condenser, but under some circumstances its use is found to be a matter of considerable convenience. This valve is so constructed that should the supply of condensing water at any time fail, the pressure of the exhaust steam will lift it and permit the exhaust steam to pass directly to the atmosphere. Should the supply of water not be again available for some time, by raising the handle the valve is held permanently open. When this valve is used it can be located as represented, or at any more convenient point in the exhaust pipe.

In Fig. 5 the condenser is represented as taking its water under pressure from below, and in Fig. 6 as lifting its water supply. As arranged in Fig. 6, a small live steam pipe is connected at *H*, the flow of steam to the condenser being controlled by means of the handle *G*. To start the condenser when it must lift its water, steam is admitted through this pipe, which raises the water to the condenser. After the engine is started the handle *G* is gradually turned till the live steam supply is entirely shut off, the exhaust steam alone raising the water from a depth of 12 to 13 feet. When it is desired to lift water from a lower level than this, (say to 20 feet) it is done by keeping the handle slightly opened, thus admitting a small quantity of live steam. This is rarely found necessary, as it is generally practicable to set the condenser so near the water that the exhaust steam alone will lift it.

In Fig. 7 the condenser is shown arranged for lifting its water, and with the discharge so situated that water is likely to rise above the outlet. In this case the starting valve *E*, is located in the discharge pipe. This is an ordinary globe valve, which in starting is opened to permit a small quantity of water to escape. Directly after starting this valve is closed, the discharge going on regularly notwithstanding the water is anywhere above the outlet, as indicated in the engraving. This engraving also represents a valve *I*, connecting the suction and discharge pipes. This is used where the supply of water is limited. By opening it, a part of the water may be turned from the discharge into the suction, and so used over again.

In using these condensers a vacuum can always be formed before starting the engine if desirable. The entire apparatus is portable, of neat appearance, requires no foundation, occupies but little space, and needs no lubrication. There are no parts liable to wear, and the joints are so made that it can readily be taken apart should it be desired. The manufacturers of this condenser are Schutte & Goehring, Philadelphia; the New York agent for their sale is A. Aller, 109 Liberty street, and the Boston agent, A. F. Upton, 7 Oliver street.

Samples showing this device form part of the exhibit of the manufacturers at the Exposition of Railway Appliances at Chicago.

The Mechanical Engineers' Meeting at Cleveland.

The American Society of Mechanical Engineers met last Tuesday evening at Cleveland, Ohio, and conducted their sessions according to programme published in our issue of June 2, adjourning Thursday evening.

The President, E. D. Leavitt, Jr., occupied the chair, and about eighty members were present. Fifty-four new members were elected by ballot. The papers read were mostly short, plain and practical. We present below two of them entire and an abstract of another, and will refer to the others in future issues.

Abstract of Paper on "The Marine Engine of the Lakes, and a Device for Getting Them off The Dead-Centers."

BY J. F. HOLLOWAY, CLEVELAND, O.

The marine engines in use upon the lakes are almost entirely of the inverted direct-acting type. By far the greatest number of these lake engines have single or tandem cylinders connected to a single crank. The next largest number in use are double engines, attached to cranks placed at right angles with each other; while there are a few of the more lately built double engines that have the cranks placed directly opposite each other.

The early propeller engines were simple high-pressure cylinder, placed on the top of wooden posts, or gallows frames, which rested upon wooden floor-timbers in the bottom of the hull. The conditions under which the marine engine of to-day has arrived at its present proportions are somewhat peculiar.

At the first, the marine engine here was not only simple and non-condensing, but it was small as well. Steam cylinders from 16 to 20 inches bore were the rule. The vessels in which they were used ranged from 275 to 350 tons burden.

The small propellers have in their turn been supplanted by steamers of 270 ft. length, 40 ft. beam, 20 ft. depth of hold; and the little "Puffing Billy" engines have given place to massive, cumbersome compound engines.

While there has been such a large increase in the size of vessels, and in their engines and boilers, there has not been a corresponding increase in the width and the capacity of the harbors of the lakes, or in the depth of the water at their entrances, or in the rivers connecting the chain of lakes together. In consequence of this fact, the large increase in the carrying capacity of the present vessels has been obtained mainly by adding to their length and beam, rather than to the depth of the hold.

One of the results of putting such powerful machinery into hulls of this description is that the hull, being long and comparatively shallow, lacks vertical stiffness. It readily responds to the pulsations of the engine, until, at certain speeds, where the number of strokes comes into unison with what might be termed the time of vibration of the hull due to its weakness, the shaking becomes a very serious matter. While this is true of an engine having a single crank, the use of engines having double cranks placed at right angles does not in the least help the matter, for, not only are cranks so placed much more difficult to balance, but they have, in addition to the up-and-down motion, another motion, which may be called an *athwartship* motion. When the crank-pins of such an engine are both on one side of the main shaft, they produce a severe side thrust upon the main journal-bearing opposite them, which tends to push it sidewise. This side strain, on the return stroke of the piston, is, of course, transferred to the other side of the journal-box, and thus these alternating side thrusts, added to and merging into the up-and-down motions, combine and form a sinuous motion much more destructive to the hull than the simple up-and-down motion first referred to.

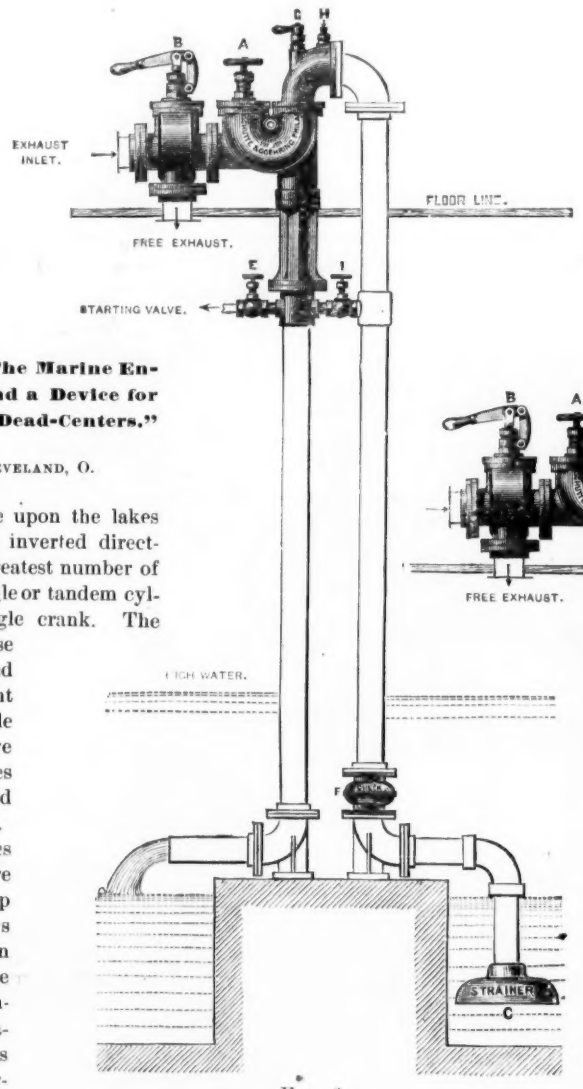


FIG. 6.

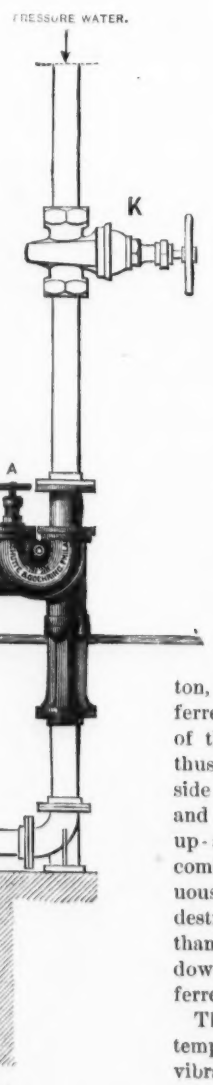


FIG. 4.

The first successful attempt to overcome this vibratory action of the engine upon the hull, was made in the construction of the steamship Amazon, which was built in the year 1873. The hull of this vessel was in some respects peculiar; it was 240 feet long, 40 feet beam, and 20 feet depth of hold. She was propelled by twin screws, and had two stern-posts, and was built without overhead arches. Each wheel was driven by a pair of fore and aft compound engines, but the cranks, instead of being placed, as usual, at right angles with each other, were placed so as to bring the crank pins directly opposite each other. These engines made, ordinarily, 75 revolutions per minute, and so well was the labor divided between the two cylinders, and so carefully had the reciprocating parts of the engine been balanced, that the main shaft, instead of being first pounded down on the bottom of the journal and then against its cap, seemed almost to be suspended in the air. The result was that there were no vibratory motions to be transferred to the hull, and it was almost impossible to tell when standing on the bow of the boat whether the engines were in motion or not.

I have tried to show that for large vessels which required double engines, that the best method was to place the crank pins directly opposite to each other. Now, it will be apparent to all, that in at least one particular both the single and the double engines will be alike. They will both have the same liability to "catch on the center," while being worked slowly, in and out of port.

Vessels heavily laden are now obliged to move slowly and with great caution while entering or leaving port, and the frequency with which the engines are made to stop, start, back, or go ahead, renders them quite liable to "catch on the center." Owing to the crowded condition of the ports, and the numerous bridges to be passed, if an engine is thus, even for a brief time, disabled, there is great danger lest the vessel shall do or receive serious damage before the engine can be started "off its center," in the usual way — the usual way being to hunt up an assistant or a fireman, and send him below slowly to pinch over the crank wheel, with a pinch-bar—an operation not only slow, but also dangerous.

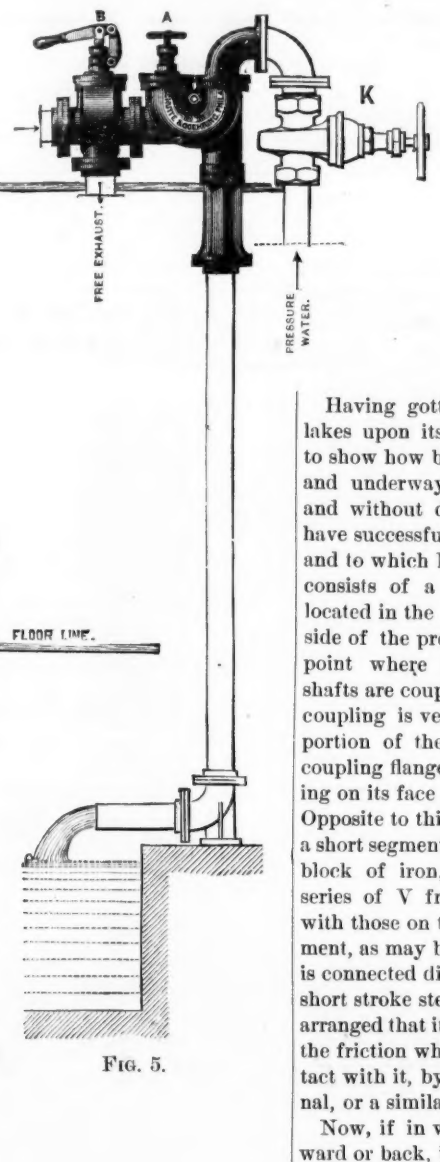


FIG. 5.

FIG. 7.—See page 1.

Having gotten the marine engine of the lakes upon its center, my next effort will be to show how best to get it "off the center," and underway again, with the least delay and without danger. The device which I have successfully employed for that purpose, and to which I desire to call your attention, consists of a short-stroke steam cylinder, located in the hold of the vessel, and along side of the propeller shaft. I place it at the point where the in-board and out-board shafts are coupled together, as the rim of the coupling is very convenient for carrying a portion of the machinery. I place on the coupling flange, or on the shaft, a wheel having on its face a series of V friction grooves. Opposite to this friction wheel, I place either a short segment of a wheel, or a short straight block of iron, which has upon its face a series of V friction grooves corresponding with those on the wheel. This block or segment, as may be most convenient to be used, is connected directly to the piston rod of the short stroke steam cylinder; and it is also so arranged that it may be made to move towards the friction wheel, and to come in close contact with it, by means of an eccentric journal, or a similar device.

Now, if in working the main engine forward or back, it becomes caught upon either the upper or lower center, the valve gear of the engine may be set for turning the engine in the direction wanted, and the throttle valve may be opened so as to admit steam on the piston if desired. Now, if the block, or segment of the starting engine be brought in close contact with the friction wheel on the propeller shaft, and steam then be admitted to the piston of the starting engine, you will readily understand that the friction wheel, and the shaft to which it is attached, will be turned a distance equal to the length of the segment or the block. This distance is regulated by the length of stroke of the cylinder of the starting engine, and will be just enough to throw the crank "off the center."

The main engine will move off at once, having already had its valve gear placed in position, with the throttle valve open; while the starting engine has pulled or pushed the segment or block out of gear with the friction wheel, and, of course, out of the way, without any further attention from the engineer. The handles for bringing the block or segment into gear with the friction wheel, as well as the handle for admitting steam to either side of the piston of the starting engine, will both be placed conveniently near to where the engineer stands while working the main engines. He is not obliged to leave his place to work the starting engine.

The starting engine is designed to work either way, and to turn the engine off either center. If, when it is required for use, the piston should happen to be at the wrong end of the cylinder, the engineer will move the block or segment back from contact with the friction wheel, will make one stroke of the piston without touching the wheel, and will then move the segment or block back in contact again, when the starting engine will be ready to turn the propeller shaft in the direction wanted. This is done with but a very slight loss of time, and without any necessity for calling upon any one for assistance.

Economy in Lubrication of Machinery.

BY GEO. N. COMLY, EDGEMOOR, WILMINGTON, DEL.

In large manufacturing establishments the sum of money paid annually for lubricants is surprisingly great, and where oil is the lubricant the quantity wasted is a very large percentage of the total amount purchased.

Being convinced that such was the case, I endeavored to ascertain the actual quantity of lubricating material used in a given time on the various machines and in the various shops connected with the establishment at which I am engaged.

The result was startling, and the investigation proved that one of the most extravagant users of oil was the vertical engine used for driving the principal part of the works used for machine shop and bridge construction, etc.

The engine was nominally 60 horse-power, with 16-inch cylinder and 18 inch stroke, with an 84-inch diameter pulley, making 106 revolutions per minute, but the indicator cards were evidence of the fact that frequently 83 horse-power were produced by the engine.

Owing to the fact that the engine was overloaded, the crank-shaft bearings and crank pin gave much trouble by heating, and occasionally it was necessary to stop the engine during working hours.

The expense for lubricating oils on this engine during the month of May, 1882, was at the rate of $3\frac{58}{100}$ cents per hour of the time during which the engine was actually running. The oil used was cosmo-lubric No. 2, costing 65 cents per gallon, and the specific gravity of the oil was 26° Beaume.

During June the oil cost $3\frac{91}{100}$ cents per hour run, and the engine was running 120 hours per week, or an average of 20 hours per day.

About the 1st of July I commenced using No. 10 lubricine-grease on the crank shaft barings *instead* of *oil*, and the result was the engine shaft bearings worked much cooler, gave no more trouble, and the cost of the lubricating material was reduced to $1\frac{15}{100}$ cents per hour run.

The crank pin at this time was still using oil, and continued so doing until October 9th, when I had a copper box attached to the stub-end of the connecting rod close to the crank pin with a ½ inch tube connecting the box with the crank pin bearing, and No. 4 lubricine-grease packed in it. No. 10 lubricine was also applied to the guides for the crosshead, the result being that the cost of lubrication was still further reduced to $\frac{78}{100}$ of 1 cent per hour run, and the guides and pin worked much cooler than they did previously when oil was used.

A mixture of palm-grease and beeswax in proper proportions will compare favorably in efficiency to the lubricine-grease.

I have also found mixtures of beeswax and tallow or beeswax and suet to work very well as lubricants for shafting. The relative proportions must, of course, be made to suit circumstances.

During the past eight months the line shafting has been running *without oil*, depending exclusively on the mixtures such as already described. The shafting is all provided with ball and socket hanger boxes, and the top half of the box has two cups cast in it, in which the grease is packed, each having a cast-iron cover fitting closely over it to keep out the dust. This cover is chained fast by a very light chain, to prevent it from being lost or knocked down by ladders, etc.

The center oil hole, where a self-oiler is usually placed, should be stopped up with a cork to keep out dust at that point, and the use of oil is not allowed on any of the shaft bearings where the grease can be applied.

By the regulations already described, the cost of lubricants has been reduced $44\frac{6}{10}\%$ in the cases noted above.

Means have been provided for using the grease on nearly all of the engines running at the works and on several of the heavy machines, the result being a saving of lubricant and cool running of the journals.

It is better, when applying the grease, to make large holes in the caps of the bearings (perhaps 1¼ or 1½ inches diameter, if allowable), and permit the grease to be packed directly on the journal surface. Where this cannot be done, a funnel-shaped cup is attached to the oil hole, in which is a copper rod, one end of which presses against the shaft, while the other end passes through a spiral spring, which is tightened to the required tension by a screwed cap. The cup is filled with the grease, and the rod passing through it melts the grease by the heat caused by the friction of the copper rod on the journal, the spring being tightened sufficiently to produce the necessary friction on the end of the rod.

Plain copper boxes, however, are frequently preferable, with lids to keep out dust. A piece of copper rod run through the center of the box touches the shaft, and the hole between box and shaft is made much larger than the size of the rod of copper, so that the grease can be well pushed down on to the shaft.

After the reading of the above paper, J. J. Grant said they (Grant & Bogert Machine Tool Works) were running their line shaft with similar lubrication. The bearings were always cold, and the cups required no attention. He considered it a great success.

Mr. Comly said, in explanation, that the boxes were originally of bronze; then they lined them with a composition of lead and antimony. But, although they run better, they always run hot till they used lubricine, when they had no further trouble.

C. J. H. Woodbury said his observations were that grease costs less, but that the friction was greater than with oil. He instanced a mill where the change had been made from oil to grease. It was thought that the friction was increased, so two shafts equally loaded were tried—one with grease and the other with oil. He tested the matter, and found that where oil was used the temperature was increased but eight degrees; where grease was used the increase was thirty-eight degrees above the temperature in the room. The friction surface was 535 feet per minute; pressure, fourteen pounds per square inch. The friction was increased 33 per cent. by the use of grease. He thought the oil used by Mr. Comly was too light for heavy bearings. Cotton mills generally were using lighter oil. In one mill, where the power was limited, the output was increased five per cent. by the use of lighter oil. In another instance they could run with the gate partially closed. Where journals would not run cool, however, it was necessary to use heavy oil, or even grease, and submit to loss from increased friction

Fig. 1.

Fig. 3.

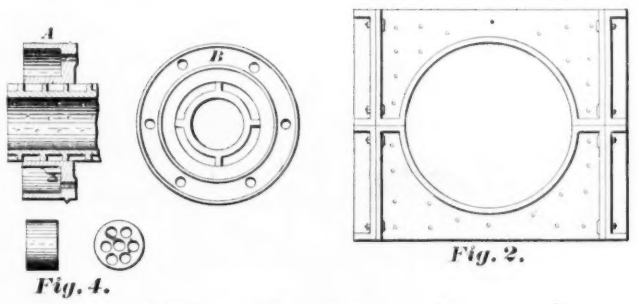


Fig. 4. *Fig. 2.*

METHOD OF CASTING FLANGE PIPE.

A New Method of Casting Flange Pipe.

BY PROF. JOHN E. SWEET, SYRACUSE, N. Y.

Edison says "he attributes a large part of his success as an inventor to the fact that he knows so many things that won't work;" and again, that "he does not think he can make many more mistakes, as he must have made them about all already."

Our experience in attempting to cast flange pipe so they should come out of the sand complete has often reminded me of Edison's remarks, for I now know lots of things that won't work, while the number of mistakes appears to have reached about 95 out of a possible hundred.

Having too much foundry, an order was accepted for a lot of flange pipe, and having too small facilities for facing and drilling the attempt was made to cast the ends faced true and the bolt holes cored.

The plan consists in casting the ends of the pipe against a chill, and the arrangement is shown in the figures. Fig. 1 shows the pattern, which differs from the ordinary pipe pattern in having movable flanges to suit different lengths of pipe, and in having the core prints the full size of the flanges instead of the size of the bore.

The flask, Fig. 2, is of the ordinary iron sort, having ends adjustable at intervals of a couple of inches, and with openings in the ends equal to the size of the core prints.

The core bar, Fig. 3, is an inch or two smaller than the pipe, having circular flanges an inch and a half or two inches apart and four ribs throughout its entire length.

The core bar has the ribs turned true and to a given size, upon which is fitted two chills, shown as *A*, *A*.

The chills may be set in any position to suit the length of pipe required. The faces are recessed so as to form a facing for the packing on the finished pipe; and as many holes as there are to be bolt-holes in the flange are bored completely through the chill, accurately spaced and reamed slightly tapering.

The outsides of the chills are turned to the same size as the prints on the pattern, except that there is left on the outside a small sharp projection about one-eighth inch high—and this is the sharpest dodge in the whole scheme.

The chills when on the bar form journals, so that when rested in proper bearings the core bar may be rotated. Common moulding sand is used for the core, and when swept up is as true as if turned in a lathe. When the flask is rammed up and the pattern removed, both ends are open to the full size of the flange. When the core is set the chills close up the ends, except the holes for bolt cores, and the projecting V ribs are pressed into the sand and make a perfect stop to prevent the iron from running out.

Cores of the size of the bolt holes, and some three or four inches in length, are made and passed through the chills until they strike the green sand, so that when the pipes are cast the bolt holes are more nearly correct than the ordinary drilled holes.

For making the bolt-hole cores we have blocks like the cylinder of a revolver, Fig. 4, with several cores in which the cores are made and baked, turning them out as perfect as if made by machinery. The faces of the pipe are smooth and good enough to pack with rubber gaskets.

This all seems simple enough now, but it worked with indifferent success until we learned the trade, and in learning the trade the apprentices made by far the best headway.

A subscriber writes us that the engineers of Cincinnati have organized a Society of Stationary Engineers, and received a charter from N. A. of S. E. H. A. Dow is president, and Joseph Kohler secretary. He says the engineers of that city "are bound to keep up with the times, and advance the cause with her sister cities.

Master Car Builders' Convention Notes.

CHICAGO, June 12th, 1883.

The business proper of the meeting was commenced by an address from President Garey, in which he alluded to the reconstruction of the association, as denoted in the new constitution, and to its probable effect upon the organization and its work. He reviewed briefly the work accomplished, and outlined what was to do, the details of the programme they were entering upon being deemed the most urgent. During the past year they had lost by death two members, Alpheno Gleason of the Old Colony Railroad, and Howard Fry of the New York Lake Shore & Buffalo Railroad, both of whose upright lives he eulogized.

From the appearance of the subject up for investigation at this meeting, it looks as if the association was ready to enter upon a range of hard work. Reports are in from committees appointed to find full information about sharp flanges, and their cause and prevention; the causes of accidents to trainmen, and what means can and should be provided to protect train and yard men from injury; on the most economical carrying capacity for freight cars, and what are safe and economical loads for axles of given size; on the economy of grinding cast-iron car wheels; on refrigerator cars; on heating of cars, and what are the elements of safety, economy and comfort of the various methods; on standard freight and passenger car trucks. That looks like a formidable list of subjects, but it was the intention to go into six more topics relating to car construction. For some reason the reports did not come in, so the subjects went over.

The first report read was that on sharp flanges. The committee attributed the sharpening of flanges to various causes: 1st. From the head of the rail being different in form to the tread of the wheel. 2d. Defects in construction or condition of trucks, such as unequal size of wheels; wheels placed on axles at unequal distances from journal; wheels gauged too wide, and trucks out of square. The member who opened the discussion on this subject took the ground that the principal cause of the destructive flange-cutting so common all over the country was the angle of the rail head not being the same as that of the wheel tread. This gave rise to animated, not to say heated, discussion, wherein a member asserted that in examining car trucks that were running hard, he found the wheels as much as $2\frac{3}{8}$" out of square. To the practice of putting trucks together in such a careless way that the wheels were out of tram, he attributed the cutting of flanges. Other speakers thought that unequal size of wheels on the same axle, originating from wear or otherwise, was the leading cause of flange cutting. A Mr. Williams, from England, was called on to speak, and he gave some very cogent reasons for the faith he held that the odd sizes of wheel was to blame for flange cutting. In this direction the whole drift of the discussion tended, and the expressed sense of the speakers was, that unequal size of wheels was responsible for the defect which the committee was investigating. Two or three speakers were disposed to believe that defects of truck construction, which pushed the load upon one side of the truck, had something to do with flange cutting, and they probably were right. The debate was lively and interesting, but the report of the committee covered every point raised by the speakers.

The next report read was on the "Causes of Accidents to Train-Men." In investigating this subject, which has been several times before the association, the committee received replies to their circulars asking for information from only thirteen members. No new point seemed to be elicited, but the leading causes of danger are well understood, and are covered by the recommendations of the report. The committee make certain suggestions to builders looking towards strength of dead-woods; they urge the adoption of certain improvements in ladders and hand-holds, and request that draw heads shall be maintained at the same height above the rail whatever kind of pattern may be used. While anxious to recommend some automatic coupler, the committee refrained from doing so, probably because they could not make up their minds to face the disappointed patentees who would be left out in the cold. This does not appear in the report, however. As points worthy of discussion, the committee present—1st. Uniformity in dimensions and location of dead-woods. 2d. Handles at end of car for making couplings. 3d. Steps and handles at all four corners of car instead of two, to aid in making couplings and mounting car. 4th. Steps (meaning blocks, probably) between guard and switch rail to prevent train-men from getting their feet caught between the rails. 5th. End platforms and double dead-woods on all freight cars. 6th. Carefully-constructed and properly-kept running boards, steps, ladders, brake staffs, pawls and brake wheels; cars to be rejected by connecting lines, if not in as perfect condition as possible after a given time."

Compound Power Vise and Brace Wrench.

The two engravings which accompany this represent, the one a compound power parallel jawed vise, and the other the principles involved in the construction of the vise applied to a brace wrench.

Referring to the vise, the jaws are actuated by means of the steel screws at the top and bottom, which are made with right and left hand threads, in such a way that the right-hand thread of one screw corresponds, in position, with the left-hand thread of the other.

The nuts in which these screws work are cylindrical pieces of steel, threaded at right angles to their axis. The ends of these nuts fit in corresponding holes in the jaws or legs of the vise, in such a way as to be free to turn in them.

By this construction it will be readily seen that although the jaws may be opened in such a way as to throw them out of parallelism, no increased strain will be thrown on the screws, the nuts turning in their bearings to preserve correct alignment under all conditions.

The lower ends of the vise legs are fitted to slide in the bottom section, which is drilled longitudinally and milled through its upper surface with a small mill to form a bearing for the purpose. This permits motion of the legs at the bottom without straining the bottom screw, which passes through the upper part of the lower section without bearing in the hole, a small screw in this section entering a groove in the screw to prevent endlong motion.

In clamping a piece with this vise the jaws are brought to a bearing against it by using the upper screw, when by turning the lower screw in the same direction, the bottoms of the legs are spread, making of them levers with the power applied at the end of the long arms, the upper nuts being the fulcrums, the jaws turning upon them for that purpose. By this means, with no strain on the screws except longitudinally, the jaws are brought to bear against the piece with a force corresponding to the leverage of the legs and the action of the screw, or the leverage of the screw instead of being decreased is multiplied several times, making even a small vise hold with a tenacity that would hardly be credited.

At present these vises are made in sizes up to 6″, for all purposes for which a strong hand vise is required, being especially adapted for use in telegraph, telephone and electric light construction.

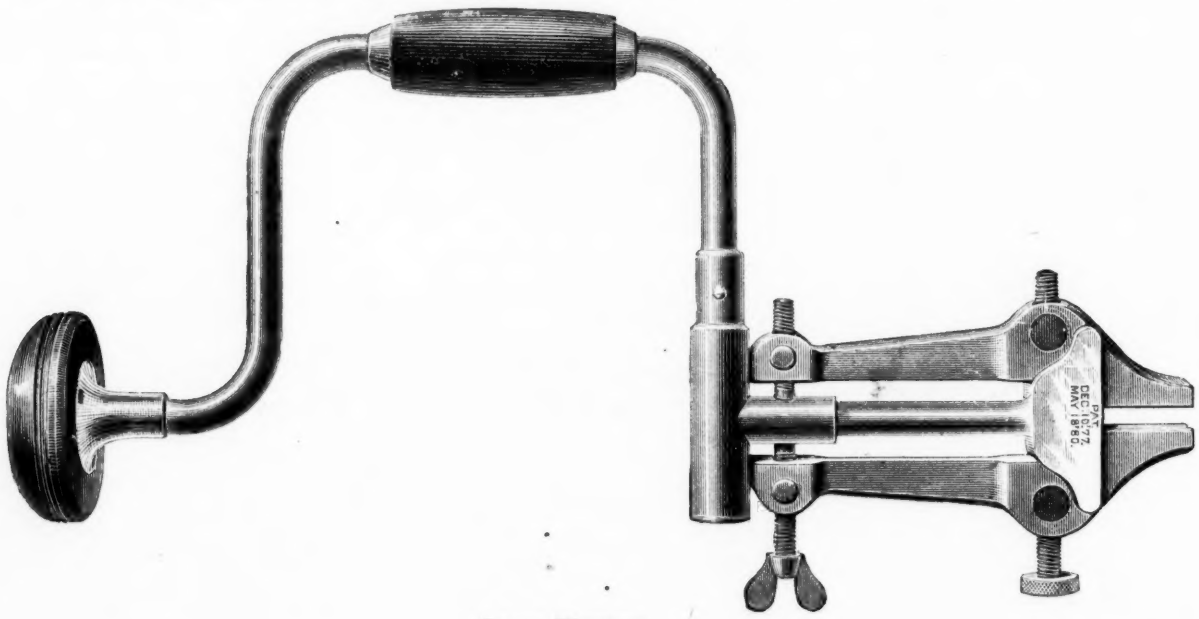
They are neatly finished from dropped steel forgings.

The brace is also made of steel, and will hold any form of tool, whether of round, square or three-cornered section.

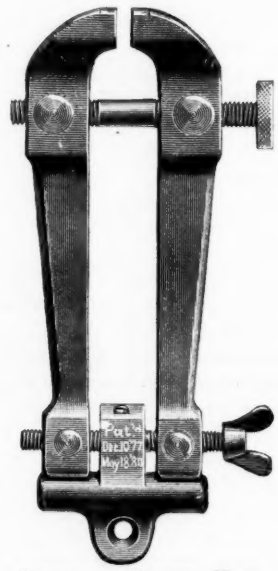
It may be used for holding bits or tools for boring, reaming, etc., or for a rapid acting wrench, grasping from 0 up to an 1¼ inch nut.

Both the vise and the brace are made interchangeable in their parts.

They are manufactured by Cook & McLane, 81 Center street, New York City.



BRACE WRENCH.



COMPOUND POWER VISE.

The Use of Coke in Melting Iron.

BY D. F. TREACY.

The practicability of using coke instead of coal in melting iron has, I find of late, been engaging to a considerable extent the attention of our intelligent foundrymen in New York and vicinity. Considerable difficulty seems to be experienced in getting it to work properly, and many foundrymen have given up the attempt and returned to the use of coal. This, I must say, has not been our experience. We have been using Pennsylvania coke since November 1st, 1882, and we will continue to use it so long as we can purchase it at a fair price.

Previous to trying it in our factory, the writer had a conversation on the matter with a foundryman of large experience, who was using coke. He inquired what style of cupola we had, and how high the tuyeres were from the bottom. I explained to him that we had an ordinary straight cupola, and that the back tuyeres were about 6″ from the sand-bed. He declared that with such a furnace we could never successfully use coke, and that if we attempted to do so we would assuredly "get stuck." But he did not give any satisfactory reason why such a thing should occur.

I met another foundryman who was, or had been, using coke. He said coke was a good thing, no doubt; it would melt iron faster than coal, but its drawback was that a man would require a brickyard in connection with his foundry—it had burnt his cupola out in just one week. Some objected to the use of coke because, they asserted, it made a greater quantity of slag than coal did, and others claimed that it was necessary to use coal, at least for the first bed.

As I was not satisfied of the soundness of these objections, and as in my earliest experience in iron melting I had to some slight extent used coke, I determined to give the product of Connellsville a trial.

The result has been entirely satisfactory, and has surpassed my highest expectations. After some few experiments as to the manner and quantity necessary in charging the furnace, we have used it continuously without encountering the slightest difficulty. We have not changed our cupola in any way, and do not intend to do so. We do not use any coal whatever, except when we may happen to run short of coke. We intended to line up our cupola last Thanksgiving day, but did not do so until the 1st of April, and then it showed less signs of being burnt out than if we had used coal. As to the objection that coke creates slag, our experience is that we have no more slag now than we had when using coal. We find the use of coal with coke quite unnecessary. This fact may be of benefit to those contemplating the change, and whose arrangements are somewhat similar to ours.

Of the advantages of coke over coal, the principal one, of course, is that it is much cheaper. In using coal we thought we were doing well if we melted from five and a half (5½) to six (6) pounds of iron to one (1) pound of coal. We find now that we can melt from eight and a half (8½) to nine (9) pounds of iron to one (1) pound of coke. We have melted as high as nine and a half, but I do not consider it safe to go above nine. Another consideration is that there is no waste to speak of in coke. If you buy fifty tons of coke you get your weight. Put it in the yard and you can safely count on having fifty tons of fuel. But if you take in fifty tons of coal, you cannot count on more than from forty-five to forty-eight tons for use. Intelligent foundrymen will readily agree with me in this estimate.

Another advantage is that coke will melt iron in two-thirds of the time necessary in using coal. We are melting from sixteen to twenty-four thousand pounds of iron per day, and the use of coke gives us over an hour and a half longer for moulding each day. Some foundrymen may say this does not make any difference—that men will do only a certain amount as a day's work. This is not true of any well-regulated establishment. But even if it were true, will a man not do his work better when he has eight and a half hours to do it in than when he has only seven? This idea of a set day's work is exploded. A day's work is set by the amount a man can do, and he certainly can do more in eight or nine hours than he can in six or seven. Take, for instance, twenty or twenty-five men working on jobbing work. Five or six of them will have their jobs finished at 1.30 or 2 o'clock. They come to the foreman and ask what they shall "put in next." He will naturally look around and send them to help some others who are not likely to be quite ready "when the wind goes on" at, say, 3 o'clock. But if the time for putting on the blast is 4 or 4.30 o'clock, the foreman will find small jobs for those who finish up earlier, and these "small jobs" will count high in the balance sheet at the end of the year. And again, I do not know of anything more demoralizing to a shop than to have certain of the men standing around from a half to two hours waiting for their iron.

It used to take from an hour to an hour and a half to pick our cupola down when we melted with coal. I have timed our man on several occasions since we began using coke, and I find that his average time now is nine minutes. The time thus saved is employed very advantageously in keeping the cupola in better repair, lining the large ladles, &c.

The manufacturers of this Pennsylvania coke claim that you get better and softer iron by using it than you can by using coal. This I am not prepared to entirely corroborate, but we certainly have less trouble from unsound castings since we began its use than we had when using coal. I think we get our mixtures better by the iron being melted more rapidly; there is more thorough combustion, and less danger of the charges "hanging."

Crop prospects have improved greatly within the last three weeks, thus favorably affecting general trade.

Extracts from Chordal's Letters.

LITERATURE OF THE PROFESSIONAL MAN AND THE ARTISAN—THE DEAD LEVEL MECHANIC'S READING—PUTTING YOURSELF IN THE DRUMMER'S PLACE—HOW A GENERAL MANAGER DODGES THE DRUMMERS—THE DRUMMER A MAN TO BE WELCOMED—CAST GEARS ON BRITISH MACHINE TOOLS—LOOSE AND TIGHT JOURNAL FITS.

Mr. Editor:

* * * The professional man is supposed to be a reading man. It is hard to tell just what is meant by the term professional man, but I would define it as one who is engaged in practice based upon the record of previous practice by others. The engineering paper, for instance, is supposed to represent the progress of the engineering art. He who reads it may properly be supposed to be thoroughly posted as to all past progress. The literature of the past, abstracts, indexes, compendiums, encyclopedias and special treatises, all these are supposed to be at the hands of the professional man in order that he may bring his knowledge from a state of zero up to the last achievement in the art. The field of engineering literature is therefore limited to an exposition of to-day's progress. The professional man looks for yesterday's record in the literature of the past.

* * * The literature of the artisan is radically different in its scope from the literature of the professional man. The artisan is not a reading man; he has no indexes, or abstracts, or treatises. He would not read if he had them. He thinks he is doing well by himself if he reads the literature of the day. If his literature only tells him of improvements in his art, he may not know what the improvements refer to.

* * * The apprentice boy in a machine shop with a weakness for reading trade literature finds in the simplest every-day matter a subject of novelty to himself, and in the course of time his mind becomes stocked with material gathered there item by item, each one as old as the hills to the world, but as fresh as the daisies to him.

* * * The apprentice boy sits on a block at noon reading a mechanical paper, most likely the AMERICAN MACHINIST, and is thoroughly interested in an illustrated article on lining up engine guides. Some old gray-haired fellow looks over his shoulder, gets a general idea of the illustrations, and sneeringly remarks to the boy: "Pshaw! that thing's a thousand years old. Is that what you fellows read about in those papers?" If the boy is smart he will reply, "I am 14 years old, and this is the first I ever knew of this guide business. How old were you when you found it out?"

* * * When this same boy gets to be, say, 50 years old, he may possibly get disgusted with this kind of shop literature, and begin to think that the editor ought to get licked for putting old things in the paper, thinking they can be passed off for novelties. He may forget his own experience.

* * * Professional literature forms the annals of professional progress. The arti-

san's literature is not, and need not be, consecutive in any of its arrangements. It presents a series of items which each individual arranges in his own mind to form his own individual annals of progress. A column in the AMERICAN MACHINIST showing which way a grindstone ought to run to put a good edge on tools would be of great value to a great many machinists, and in a certain number of years the same article would be of great value to a great many more machinists, who are not machinists at all, and probably were not born when the first article was published.

The real fact is that the literature of the artisan to be of any real value must contain repetitions on literary subjects, and there is a fine problem involved in finding out how often a repetition should occur.

* * * I notice that the dead-level mechanic whose entire reading throughout his whole life consists of a single trade paper, begins this reading, if he ever begins it, at about the time he first becomes interested in the trade. But he keeps it up a certain number of years only. For some reason this class always do stop reading entirely. I suppose when their trade loses its enthusiastic features, and becomes a mere hum-drum and bread-making vocation to them, they think it about time to leave off the flummy-diddle.

* * * The machine drummer has finally come to the surface, I see, in the AMERICAN MACHINIST. He deserves some recognition. He may be a nuisance sometimes, but it would be hard to get along without him. There is something exasperating in sitting in a panic-stricken shop and having some fellow come in to sell you some oil. You don't want any oil; haven't got any use for any oil, and it don't look as though you ever would need any oil. You get rid of him, and in comes another fellow to sell waste. You don't need any waste if you don't need any oil, and you get rid of this man. Then in comes another oil man. Then another man with oil. You begin to blackguard these oil men, and ask them if they think you swim in oil. It is a noticeable feature that the less use you have for oil, the more men come around and try to sell you oil. From oil it goes to other things, and you get tired of the whole genus drummer.

But you pack up your own grip-sack, and start out on a drumming tour to see if you can't get some work to do. May be you make gauge cocks for a living. You strike a railroad shop, and find a big sign hanging out in front of the master mechanic's office, "No oil wanted here." You go past the sign and hunt up the master mechanic, and congratulate him on the happy thought of having that sign out, and you tell him you will do the same thing yourself when you get home, and thus guard yourself against the infliction of the oil men. Then the master mechanic says that he don't want any gauge cocks, either. As you go past the sign at the door you hesitate to look at it for fear it will read differently from what it did when you entered.

* * * There is a certain corporation with a certain handsome set of corporation offices. Away back through a half dozen intermediate offices is the inner penetralia of the General Manager. The Governor of the State could only get back there by going through certain ceremonious forms. The oil drummer looks neither to the right nor to the left, but makes his first and only bow when he reaches this inner sanctum. The General Manager threw out extra pickets, placed a boy in the outer office, with gates at intermediate railings and signs at doors; but still the drummer bowed before him, and before him only. At last, happy thought! the Manager sets the office boy to addressing circulars in his distant quarters, and establishes himself at a desk inside the first entrance door. No drummer honors him with a nod.

* * * Leaving out of consideration the real drummy-drummer, who never lets you lose sight of the fact that he comes to you to make a sale; and leaving out of consideration the ignoramuses who know nothing but the pat tale stuffed into them before they start out, the drummer is a man to be welcomed. He is a traveler who carries the news of the world. He brings you the latest and the freshest, if you will gossip five minutes with him, and he adds your little mite of gossip to the store. The drummer who travels with his eyes open if he has really good sense, should be able to make himself welcome in a large class of machine shops.

* * * Speaking of drummers, reminds me of a Scotchman who travels in the governor business. This man can give you the latest news in the governor world, be it good or evil for him. He sees everything that is new-fangled in the shops, and knows of their failures and successes. He can give you data and points to help you in your troubles. He may not say a word about governors, and loses no trade by his silence.

* * * I saw an imported British machine tool being set up the other day, and noticed some features about it which would strike an American as being very peculiar. The gearing, of course, was all cast. I have always supposed that the Britishers, using cast gearing in metal working tools, would naturally have reduced gear casting to a fine art The gears in this particular instance were well cast, but did not strike me as being superior to the cast gearing produced in the best American establishments using cast gearing on a rougher class of machinery. The main thing which struck me on this machine was the looseness of the running fits. Clutch gearing, for instance, that we in this country fit about as tight as it will run, would in this machine be very near, if not quite, one thirty-second of an inch loose on its shaft. A fine-haired American mechanic was setting this machine up, and I asked him what he thought of those gear fits, and he replied that it was so radically different from anything he had ever seen before in his life that it seemed worthy only of broad condemnation, but that since he had been studying over the matter he had decided that there was some merit at the base of it. "You see," said he, "that those gears can't get stuck on the shaft. Now, that is a grand thing to commence on. This tool has never been run, but lots more have been built just like it, and when we start it up we will probably find it to be all right and to run nicely, and freely, and smoothly, as an ordinary American built tool of the same class. If it will do this, it looks as though it ought to keep doing it forever, for it can never wear out. The fits are so bad they can never get any worse."

* * * I don't know whether this is good logic or not, but there must be a something in it. The American fit is as tight as it will run, and it is expected to wear loose and finally wear out. The fits on this machine were as loose as proper running would permit, and they could not reasonably be expected to get any looser.

When I say the shafts in this machine were one thirty-second inch loose in their gears and boxes I don't exaggerate. The question arises in my mind whether there is any difference between old, worn-out surfaces which have ground away till they are one thirty-second inch loose, and brand-new true surfaces made one thirty-second inch loose. In this particular machine there are probably not less than a dozen pairs of clutch gears, which are, of course, loose on their shafts; and there are any number of shaft boxes. I intend to take a look at this machine when it gets running, and see if there is any noticeable badness chargeable to this system of extraordinary loose fits.

* * * Very respectfully,

CHORDAL.

On some portions of the London and North-Western Railway, says the *Ironmonger*, the practice hitherto prevailing of allowing the rails to rest on wooden sleepers is being abandoned. It has been recently stated that iron sleepers would probably take the place of the wooden ones, but a portion of the main line between London and Birmingham is now being laid with sleepers composed of steel.

LETTERS FROM PRACTICAL MEN.

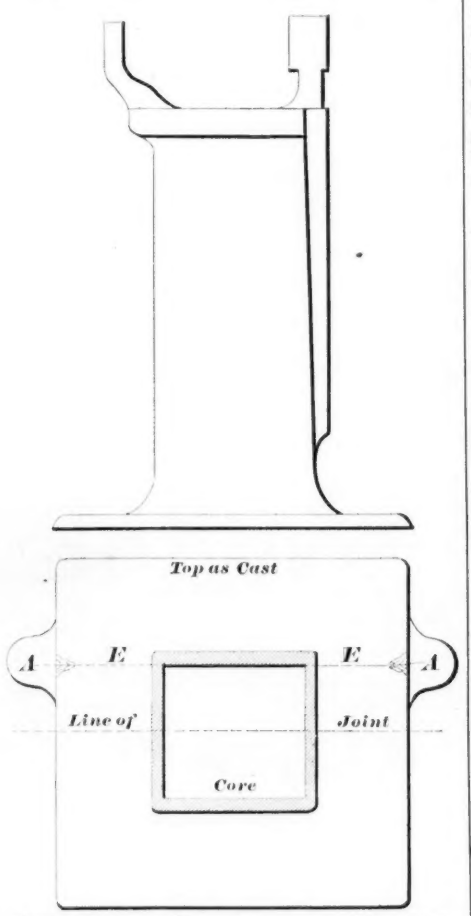
Overcoming a Difficulty in a Foundry.

Editor American Machinist:

Mr. West, in a recent number, suggests what I believe would be found to work well in practice—I refer to the false core to catch the dirt in casting a steam cylinder, the hole to be filled up with some suitable soft metal.

I remember overcoming a little difficulty in a foundry where I was employed some years ago—one of the best foundries in the country—the principle involved being applicable to making many other castings than the one the plan was tried upon.

I had the job to make some milling-machine beds—cupboards the boys called them—and was informed by the foreman that they had never succeeded in making one without having a bad spot in the base, that had to be mended by welding or burning in a piece, as they would not be accepted if there were any noticeable defects. The defect was believed to be dirt or core scabbing, but after examining the pattern I did not believe this to be the cause, but thought it to be cold shut. My opinion was overruled, and I made three or four, all of which had to be patched up to make them pass.



OVERCOMING A DIFFICULTY IN A FOUNDRY.

The cut shows the casting near enough for illustration. It was some 3½ feet long, and cast the side-up indicated, the bad spots that appeared in the casting being marked on the line *E*. The base was fifteen or twenty inches wide and about ⅞″ thick, running to a knife or thin edge, as indicated in the elevation.

Now, when the iron had filled up to the top of the cores that formed the cupboard, and began to flow over them, the upward flow of metal in the base was suspended for an interval of time, and the base being light and running off to a thin edge, it "froze;" and when the plate began to fill again, and so produce pressure on the chilled surface of the metal, it bent it over and formed a seam that had been called dirt.

I got two pieces of wood and whittled out blocks, as at *A*, each about 3″ long and wide, and when I rammed up the cope I placed them in line of the plate or base. When I had drawn the pattern I drew the blocks, and cast two lugs on the base. It made me smile to see the seam on the lugs instead of on the plate. All that was necessary was to chip them off (they were really no more than common gates), and the casting was perfect. A more complete cure could not have been conceived, and ever after I had a friend in the core-maker, who had been blamed for the previous results.

FOUNDRYMAN.

Wire Joints—Why Cast Iron will not Braze—Planing Cast Iron in Turpentine—Water Gauges—The Average Oil Cans.

Editor American Machinist:

In locomotive shops they never think of using anything but a copper wire joint for a steam-chest cover, and in shops where stationary engines are built or used. The common practice (as far as I have seen) is either to scrape the joint or use rubber packing. Either of these methods costs more than the copper, and with the rubber there is the necessity of renewal every time the cover is taken off.

I was called on once to pack a cover that had been giving trouble, and I took some copper wire of about No. 20 gauge and laid it around the cover, just inside the studs. After brazing the ends together, I fastened it to the cover with soft solder, to hold it in place while putting on, and then drew it down to its place, and after tapping it all round, to insure a seat at all points, the engine was started up; and, although the cover has been taken off a number of times, it goes back and is as tight as when new.

I was so well pleased with the result of using the fine wire, without the customary groove, that I afterwards tried it between flange joints on pipes and found it a success, it being only necessary to clean the face of the flange down to the solid iron, as the copper will bed into the irregularities of the iron itself.

In making the copper rings, the ends must be brazed together, for if soft solder is used the steam will soon cut it out. In soldering the ring on the flange, solder on the inside, so it will not be exposed to the action of the steam.

While talking about brazing, I had always heard that cast iron could not be brazed, but if I asked one why, would receive the answer that he did not know; so I finally tried it and then I knew.

I took two pieces and wired them together and put on the borax and spelter, the same as for wrought iron, and the spelter flowed as good as could be, but when I took the binding wire off the pieces dropped apart, and only a brassy appearance on the face of the joint showed where the spelter had been. I then broke the piece of iron and found that the spelter had gone all through it, from the fact that when the casting was hot enough for the spelter to melt, the pores were so open that it soaked up the spelter about as a sponge would soak up water.

In this case I found the saying true, that cast iron could not be brazed, but to show that "say so" is not to be always relied on I will relate another experiment that I once tried.

Our foundryman had got hold of some scrap-iron that did not mix as it was expected, and the result was that the castings were hard, and were being returned to the iron pile faster than was quite satisfactory to the proprietors.

One day I saw one of the proprietors coming with a paper in his hand, opened to an article which he wished me to read and tell him what I thought of it. The paper was a mechanical journal, and the writer, among other things, said that by using turpentine when turning cast iron, very hard iron could be turned like lead. I remarked that I had used turpentine on hard steel, but never met with very good success, but that I would try it on the iron. So I got one of the pieces that had been condemned as too hard, put it on the planer, and with a very hard tool and the turpentine flowing on the tool I started.

In about two minutes the edge was all off my tool, and I had only got about ¼″ across the work. I ground up and tried again with no better success. I then run the tool to the opposite side of the piece, and after grinding,

I finished the piece dry; so the result was that I planed ½" by grinding twice with the turpentine and 2" with once grinding dry.

Some one who wrote about water-gauges—how to keep them in good working order by blowing out often, &c ,—might have gone a step further and told his readers that the water in the glass was never perfectly still when the gauge was right, but was constantly *tetering* more or less, and whenever they see this motion they may be assured that the gauge is all right. But whenever they see the water standing stationary, be assured that there is something wrong.

Chordal and others have been bearing down on shop dogs and clamping bolts, but they don't seem to have got their eyes on the average oil cans. I use the plural, for there are several of them. Some of them have been against the corner of the lathe, or work, and have lost all shape and comeliness, and have a hole somewhere just large enough to cover your hand with oil every time you use them. When not in use they leak out more oil in one hour than you would use in all day. Another one looks all right, but sometime it has failed to *squirt*, and that it might not do so again a scratch has been used, so that the hole is so large that a spoonful of oil will be wasted every time you want a drop. The next can is found with body all bright, spout good, but no gasket between spout and body. This one does not waste quite as much oil as the others, but will leave more oil in your hands than is used on the work.

I have seen men go to the office and ask for a new can, and the proprietor would say he couldn't see what became of all the oil cans; he had got a dozen about six months ago and they were all gone.

The dozen cans cost about one dollar and a half. Not a word when he was called upon for a barrel of oil that had been wasted and had cost eight dollars.

H. REYNOLDS.

Changes Among Railroad Master Mechanics.

R. H. Soule, of Baltimore, has resigned as Superintendent of motive power of the Chicago, St. Louis & Pittsburgh Road, to take the position of Superintendent of motive power and machinery of the New York, West Shore & Buffalo Road, vice Howard Fry, deceased. His office is 24 State Street, New York.

Edward B. Wall has been appointed Superintendent of motive power of the Chicago, St. Louis & Pittsburgh Road, vice R. H. Soule, resigned.

N. E. Chapman has resigned as master of machinery of the Baltimore & Ohio Road, and A. J. Cromwell has been appointed to succeed him.

G. A. Haggerty, formerly master mechanic of the East Broad Top Road, and subsequently Superintendent of the Galena & Wisconsin Road, has been appointed Superintendent of motive power and machinery of the whole line of the Chesapeake, Ohio & Southwestern, with office at Elizabethtown, Ky.

Chas. Daniels has been appointed master mechanic of the Memphis division of the Chesapeake, Ohio & Southwestern Road, vice H. A. Wentzel, resigned.

T. W. Spencer, engineer of the Rochester division of the West Shore Road, has been appointed chief engineer of the New York State Railroad Commission.

John Ortton, formerly of the Canada Southern Road, has been appointed master mechanic of the Eastern division of the New York Central Railroad, with office at Albany, N. Y.

Railway Exposition Notes.

BY ANGUS SINCLAIR.

CHICAGO, June 9, 1883.

From the appearance of the moving masses of humanity about the buildings today, I would suppose the attendance has been greater than on any other day since the opening. And the increase of visitors has been under adverse circumstances, for the weather has been out of joint, rainy and foggy. For the last week there has been a crowd of ubiquitous youngsters round the Exposition who seemed to be everywhere. On their breasts they carried ribbons marked "Apprentice Brooks Locomotive Works," and it seemed their set purpose to miss the examination of nothing curious or interesting. I made some inquiries regarding the boys and learned, that last winter Mr. Brooks, president of the locomotive works at Dunkirk, N. Y., having become conscious of the necessity for providing means of scientific instruction for his apprentices, started a night school in connection with the works which had proved very successful. Lessons in drawing are given by H. E. Probert, principal draughtsman of the establishment, and R. H. Whitlock, a graduate of a technical school, teaches mathematics. They have not got the length of natural philosophy yet, but they are working in that direction. The value of such instruction to these boys, can only be appreciated by those who have toiled unaided up the steep road to scientific knowledge. This class, 32 in number, came in a body to visit the Exposition, their expenses being paid by Mr. Brooks personally. In dilating on the matter to a prominent railroad manager whom I accompanied round the exhibit, your genial and modest friend, Mr. LaRue, exclaimed, "Brooks only weighs 250 pounds but his heart weighs thirteen hundred."

The electric motor started to-day, after many unsuccessful efforts, and went to work with some regularity. After I get round the machine tools I will give some particulars of its construction.

THE LOCOMOTIVE DEPARTMENT.

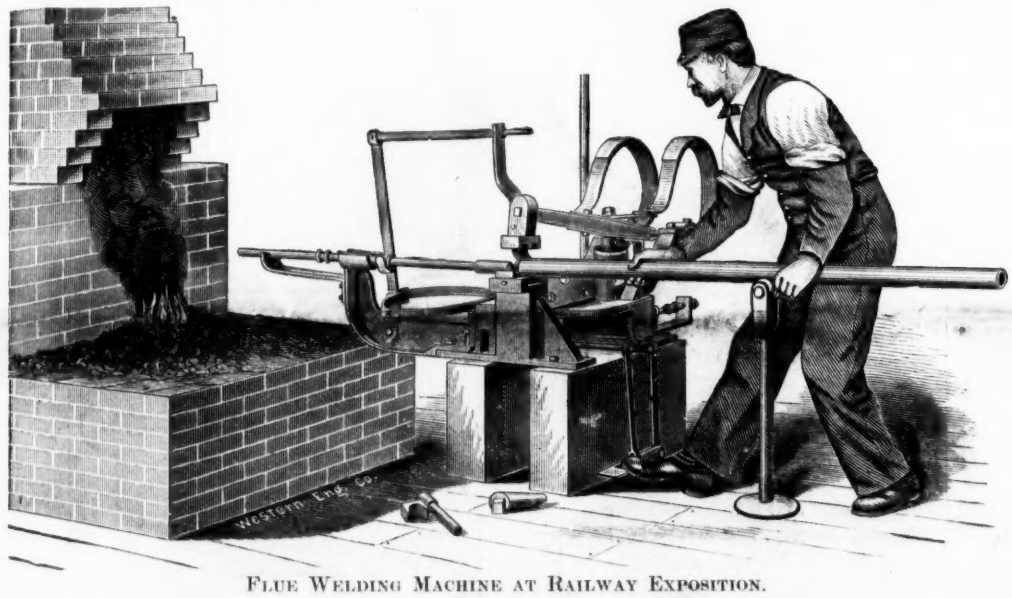
Entering the Locomotive Department, the first exhibit we reach is the Brooks. First come two Moguls, one of them with an ordinary engine truck, the other having a Bissell truck. Then comes a heavy switching engine with all the weight resting on the six drivers, after which we reach a narrow-gauge Mogul, and then a passenger engine for the same gauge. Beyond is the ordinary eight-wheel passenger engine, then a heavier passenger engine with extended smoke-box. That ends the Brooks display, and after it appears a small Porter and Bell logging engine. Then we reach the Baldwin locomotives, of which there are four exhibited—a standard and narrow-gauge consolidated engine, and two heavy passenger engines, one of them being designed for the Northern Pacific Railway. Pittsburgh engines come next, three in number, one of them of the Pennsylvania Railroad design, and built for that company. The Dickson Manufacturing Co. exhibit the next two engines, one being a small, narrow-gauge engine, possessing several novel features, and a standard passenger engine, which had just arrived and was in the course of being set up. Next comes the so-called Mastodon engine, built by Cooke for the Southern Pacific. Blue prints of her valve motion, which includes a riding cut-off valve, are exhibited on the running board, and receive much attention from mechanical railroad men. Besides the Mastodon is the Standard passenger engine for the New York, West Shore and Buffalo, designed by the late Howard Fry and built by Rogers. The engine has many features of British build, and is an object of curiosity. It is a very handsome locomotive, and is likely to do good service. Rogers has also a heavy switching or mining locomotive. The Mount Savage makers exhibit a neat narrow-gauge locomotive; Rhode Island Locomotive Works has a Standard passenger engine; the Baltimore and Ohio sent a passenger engine, besides the "Arabian"—a grasshopper, vertical-boiler engine, with the power applied through a cog which is in the curiosity department. The last of the modern exhibit is a Standard Wootten locomotive from the Philadelphia and Reading, with the fire-box adapted for burning anthracite slack; and the Shaw locomotive, which is jacked up and kept running most of the time. Both these last engines attract unflagging attention from visitors. Then, for curiosities, there is "Locomotion," built by George Stephenson in 1825 for the Stockton and Darlington Railway, of England; the "Samson," built by Timothy Hookworth, a rival of Stephenson, in 1829, and sent to Nova Scotia; the "John Bull," from which Baldwin is said to have taken the design for his first locomotive; and lastly, the "Pioneer," exhibited by the Chicago and Northwestern Company. The latter is a small engine of the Ironsides type, and was one of the first built by Baldwin, having gone into service in 1836 on the Utica and Schenectady Railroad, for which she was built. This engine was afterwards bought by the Galena and Chicago Union Railroad, and was the first engine run west of the lakes. The Pioneer has one pair of drivers, with crank axle, and the valve motion is the V hook. She looks as if still good for some service.

Nothing has been done about tests of material, and they are not likely to come off till near the end of the exhibition. Railroad men, and mechanics generally, are taking a warm interest in this unique assortment of railroad appliances.

DETROIT TUBE WELDING MACHINE.

Another time-saving device in the boilermakers' line thoroughly worthy of inspection is the Detroit Patent Tube Welding Machine exhibited doing its work, by Manning, Maxwell & Moore, of New York. [See engraving.]

This tool consists of a small trip-hammer striking the outside of the tube with dies regulated for the proper size and automatically pushing a mandrel inside of the tube to sustain the blows in welding. It swedges down the end of the tube and scrapes it off clean ready to receive copper ferrule if required. It expands the end of one tube and seduces the other that fits into it so perfectly that when driven together they form a joint that is nearly steam-tight before welding. Any kind of steel brushes, split pins or sleeves can be quickly welded on this machine. A boy who knows enough to head rivets can learn to operate the thing in two hours.



FLUE WELDING MACHINE AT RAILWAY EXPOSITION.

SHOP TOOLS AND MACHINERY.

The greater part of the shop tools and all the machinery in motion, are located in that part of the main building north of the fountain.

As we enter by the main entrance, the first exhibit reached is that of J. A. Fay & Co., of Cincinnati, which has already been described in your columns. This exhibit draws a great part of the attention from car men and visitors generally, for the machines are kept at work a great part of the time, and their celerity in changing a rough piece of timber into finished products is wonderful. This is by far the best exhibit of wood-working tools in the building.

Across the aisle is the Yale and Towne Manufacturing Company's display. The practice of using cranes, not only to raise, but to transport heavy weights from one part of a shop to another, is becoming much more common than it was a few years ago, and the Weston appliances manufactured by this company are deservedly popula for doing such work. It seems a proof of how slowly information about good appliances travels even in this advertising age, to see the wonder with which many old railroad men examine the Weston traveling cranes. The company has lately sold two 25-ton swing cranes to the Chicago and Alton people, and they are now negotiating for two traveling cranes. The testing machine, for which the company makes high claims, has not arrived yet, but it is expected to be in position in a few days, when its test will be duly recorded. There is a 20-ton scale in the exhibit which possesses some novel and valuable features. The firm claim that friction in this machine is almost nothing. With a full load of 40,000 pounds the scale will show a variation of 1 ounce. The use of knife edges is entirely abandoned and plate fulcrums are substituted. In the supports of the platform, instead of levers and knife edges, they use a cylinder and thin plate diaphragm which prevent any vibratory movement. On the platform of the exhibit, besides the fine collection of locks, is an elaborately finished safe which is secured by a time lock that runs seventy-two hours and performs its functions of opening and closing at stated hours during that period.

Next space is occupied by the exhibit of the Niles Tool Works of Hamilton, Ohio. The tools exhibited by this firm are made from entirely new patterns, and many excellent improvements in design are made. First in order is their 44"x44"x12' planer. This machine is exceptionally heavy, has two heads with entire independent feed rails long enough so that one head can be placed beyond the housing when the other feeds across the full width of 44". This machine is driven by a worm and worm gearing and has extraordinary high belt velocity.

In this tool an entire continuous box girt binds the housings and bed all together, throughout their entire breadth, which naturally secures great rigidity. This planer has been sold to the Speedwell Iron Works, Glasgow, Scotland. Next is a seven-foot boring and turning mill, designed specifically for railroad locomotive shop work. The tool is a new production of the firm, having all the best features known to these manufacturers. There is a double car axle lathe kept at work all day, and the rapidity of its execution draws constant attention. It is engaged in turning car axles for the Chicago and North-

western Railroad. The operator is an employe of the Barney & Smith Manufacturing Company, and he turns out an axle every twenty-five minutes, two cuts being invariably run over each axle with water finish. The hydrostatic press exhibited has double pump, one plunger being 2″ diameter, the other 1″ diameter. It is designed so that the larger plunger is in action to project the ram or plunger rapidly before the pressure is applied. The small one is called into requisition to complete pressing on the wheel. This machine can withstand three hundred tons pressure on an 8″ ram, a pressure which is sometimes required to push off old wheels. There is a screw machine also kept constantly in operation, which is employed in making all kinds of set screws and bolt work. Its improved Nason chasing attachment is quite original and most efficient. An arch bar drill, in this collection, is a highly finished and efficient tool. It is provided with eight spindles, the usual number being no greater than six, and is made on special order for the Northern Pacific Railroad. The feed of this machine is accomplished through the table to which the arch bar is secured, all holes being drilled simultaneously. Ample provision is made for lubrication of drills and rapid accomplishment of the work. A 16″ shaping machine exhibited has the advantage of very great weight and strength. Front part of the bed extends well down, so that the pressure exerted by the cutting tool is resisted by the tables without yielding. These tables are readily located in front of the bed at any desired point, without effort, by a simple device. All sliding parts are gibbed. The square form of gib is employed, instead of the angular. The utility of this form of gibbing is demonstrated on planer cross rails.

The saddle of this machine is moved by power to any position of the bed. The conical mandrel bearing, which is sometimes cast on the main bed piece, is here removable. Next comes a 30″ engine lathe. A pin, with an internal clutch, is provided to change feeds without change of gearing. Their well-known radial drilling machine is peculiarly adopted for railroad machine shop work. Any point within a circle of 12 feet diameter can be reached, the belt not interfering with the rotation of the arm. The arm is raised and lowered by power the full height of the column, which is eight feet. The drill spindle can be set at any angle, and it has a power feeding arrangement. The table is particularly well adapted for all kinds of angular drilling. The stand to which it is attached is secured by a central bolt, round which it swings. The table is hinged, and a leg extending down from it moves through a quadrant by which it may be secured at any point. It has a range of all angles between the horizontal and perpendicular, as its stand can be moved all round its axis. There are several other tools in this ground well worthy of inspection. All of them are sold. The greater part go to the Northern Pacific and the Nickel Plate Railroads.

Next exhibit is that of the Gordon & Maxwell Company, who are manufacturing steam pumping machinery at Hamilton, O. Their principal exhibit is a new duplex steam pump, operated by a submerged flue upright boiler, all being arranged on the same sole plate in most convenient form. This outfit is designed to supply railroad water-station tanks. A peculiarity of the pump is its simplicity, the commonest intelligence being capable of running it. The plungers are packed outside and leakages can be immediately detected. This form of pump will run for years without repairs.

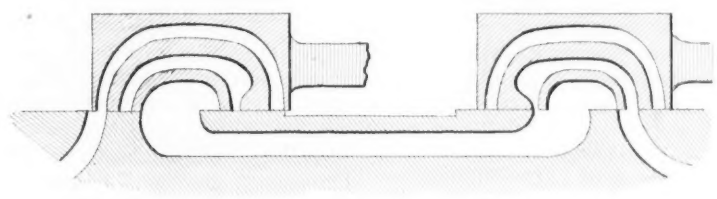
Passing several other exhibits that are not of interest to your readers, the fine display of William Sellers & Co. of Philadelphia is reached. You have already published the salient features of this exhibit, but I may mention that their large wheel lathe with its quartering rig, which excites much attention, has been sold to the New York, West Shore & Buffalo Railroad. The injectors shown are ordinary stock, mostly of the large sizes. One of them is cut in section and receives close examination from railroad men.

This brings us to the great exhibit of hydraulic machinery all grouped together in compact space. The Worthington exhibit consists of eight pumps, one having a boiler attached. Most of these pumps are very large and possess the best features of construction regularly followed by this maker.

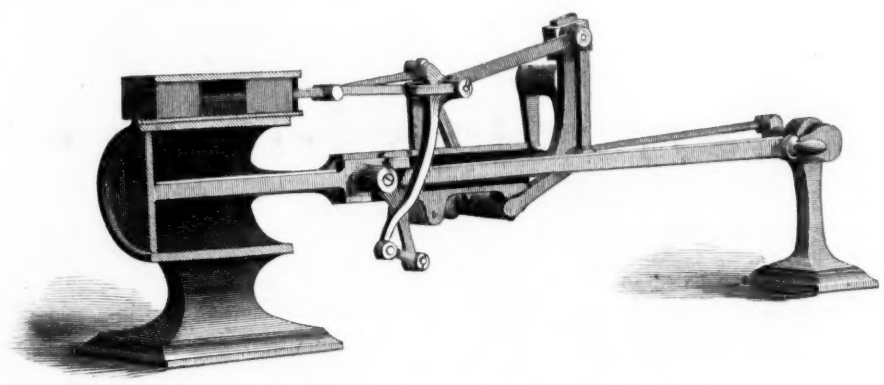
Cameron exhibits only two pumps. One, a No. 4, is exhibited cut open in the section, and a No. 7 is kept at work circulating water. When run at high speed, for which it is particularly adapted, this pump throws a tremendous stream of water. I was forcibly struck with the simplicity of the whole internal arrangement of the pump. This feature must be very valuable where repairs have to be done without the help that is skillful in doing complex work.

I have known several cases of, otherwise good, machinists in Western shops getting badly left when they went to repair steam pumps. A convenient arrangement is that the pumps can be taken apart for examination without removing the pipes.

Passing with a cursory inspection a handsome Reynolds improved Corliss engine made by E. P. Allis & Co., Milwaukee, which indicates how rapidly Northwestern machine



THE STEVENS LOCOMOTIVE VALVE



MODEL OF STEVENS VALVE GEAR.—(From Photograph.)

men are moving ahead; I pause to admire the exhibit of pulleys and shafting belonging to Jones & Laughlin, of Pittsburgh, and watch the accurate work done by the Dietz punching and shearing machine, which was illustrated and described in the AMERICAN MACHINIST some time ago. This machine is receiving much attention, and seems likely to make its mark, for the work done appears to be about as accurate as drilling, while the operation is rapid as punching.

A mortising machine exhibited by the Chain Saw Mortising Company of Chicago struck me as novel, rapid and accurate in execution. The cutters form a sort of endless chain which can be gauged to the required size, applied to the timber to be cut when it quickly works its way in cutting a clean true mortise.

Close to the end of the building, jammed nearly out of sight, a man with all the characteristics of the mere inventor with none of the business man about him, keeps watch over a machine which is greatly needed in Western railroad shops. It is a quick working arrangement which cleans the scale off a tube in about two minutes. The machine consists of a complex train of wheels, some of which draw the tube in, while others having cutters on their peripheries effectually chip off every particle of scale however thick it may originally have been. It is very ingeniously planned, and its perfecting has evidently cost much thought and labor. Cleaning tubes that have come out of a very dirty boiler with thick scale adhering to them with steel-like tenacity is a troublesome operation, and is usually performed by placing a lot in a long iron cylinder made for the purpose and revolving it by power till the concussion of the tubes against each other and the sides of the cylinder cleans them. This rig is generally voted one of the worst nuisances connected with a boiler shop on account of its merciless clatter.

The new tube cleaner is the property of Henry Otto, Bloomington, Ill.

HORATIO ALLEN ON EARLY RAILROAD DEVELOPMENT.

On the evening of June 6 the venerable Horatio Allen, of New York, delivered an address in the Exposition Building to a small audience on the "Early History of Railroads." That was the second evening Mr. Allen had intended to deliver the address, which was done by invitation of the managers of the Exposition, and he justly felt aggrieved that no arrangements were made to secure an audience. Few people among the crowds within the building knew anything of what was going on.

The speaker is by far the most celebrated living pioneer of railroad progress, and will rank in history as a leader in the great work which made America the nation of railroads. No man in America did so much to urge into movement the early efforts at railroad construction as Horatio Allen, and the railroad world, ignorant of how the early locomotive problems were worked out, often attribute to British engineers the credit of improvements which rightly belong to Allen, Cooper, Winans, Matthews and other American inventors.

Mr. Allen said that it is nearly four years more than half a century since standing on an engine that he had just started on a road built by American money and enterprise, he used the words "the day shall come when I will look upon this event with great interest."

The event referred to was the starting of the locomotive "Stonebridge Lion" on the Delaware and Hudson Canal Company's coal railroad at Honesdale, Pa. The engine was too heavy for the track, but the failure was one of the landmarks on the way to success. To explain how that experiment came to be made Mr. Allen referred backward a few years.

In 1825 Stephenson had put a locomotive upon the Stockton and Darlington Railway in England, and it proved successful in doing the work of hauling coals. This engine, though rude in construction and design, contained every essential of the locomotive that runs to-day. Word came to America of what was going on in England, and stirred up by the possibilities of what this method of transportation could do for America, a young man, an engineer on the Delaware and Hudson Canal, quit his work and went out to learn all there was to be known about railroads and locomotives. That young man was the speaker. He went to Boston to examine one of the tramway railroads built in Massachusetts; a few years before he visited some works of a similar nature at Baltimore, and after seeing other points of interest, he proceeded to New York with the intention of going to England for the purpose of studying the railroad and locomotive progress there.

At New York he met John B. Jervis who entrusted him with the work of getting iron and locomotives made in England for the Honesdale road. He had authority to contract for sixteen or seventeen miles of strap rails and two locomotives. When he reached London he went by letter of introduction to the house of a Mr. Brown, where he met Geo. Stephenson who treated him with great kindness and attention.

After contracting for the making of the iron he went to the Stockton and Darlington Railway and studied the working of the locomotives. Here he became thoroughly familiar with the engines and with their methods of carrying on the traffic; then he went to Newcastle to examine the making of locomotives in works carried on by Stephenson. While here he received a letter from Foster, Rastrick & Co., of Stonebridge, proposing to build a locomotive for him. He visited the firm and agreed to take one engine from them and one from Stephenson.

At this time the best type of boiler was a subject of controversy, one party favoring flue boilers, the other multitubular boilers, such as finally gave the locomotive its success as a rapid generator of steam. He decided to take one boiler with flues 5″ in diameter, which was the Foster-Rastrick make, while the engine he took from the Stephensons was a tubular boiler similar to the Rocket. The "Stonebridge Lion" (which took its name from the painter putting a lion's head on the boiler) was sent on first, and as is now well known, proved too heavy.

Mr. Allen regretted that Stephenson's engine did not get to Honesdale, for that engine was lighter, the same size as the Rocket and would have answered. In that case America would have started out the first high-speed locomotive, for the "Stonebridge Lion" was tried in August, 1829, and the Rainhill competition, where the Rocket made her mark, did not come off till the following October.

Shortly after his return to America, Mr. Allen was appointed chief engineer of the Charleston and Hamburg (S. C.) Railroad. When he went there he found the question of motive power still in abeyance. Two of the most eminent English engineers had been consulted by the directors of the road and they reported in favor of horses or stationary engines to operate the trains by long ropes. He was asked for a report, and he unhesitatingly recommended locomotives. His recommendation was adopted, and the Charleston and Hamburg was the first railroad in the world that decided to work the traffic by locomotives alone. As business developed he recommended improvements on the locomotives which were carried out. Boilers were made longer, the leading truck was invented and first used in this country, and in all the minor improvements we kept abreast or ahead of English practice. America got the Stockton and Darlington locomotives from England, but we required no more foreign guidance in the development of our motive power. And had Oliver Evans, our own inventor, received a little aid early in this century his genius would have made America the originator of the locomotive as well as of the steamboat.

Stevens' Locomotive Valve Motion.

The larger engraving on this page represents a model of the valve gear invented by A. J. Stevens, general master mechanic of the Southern Pacific Railroad, and exhibited among the Nathan & Dreyfus collection at the Exposition of Railway Appliances. A description, written by Angus Sinclair, was given in our last week's issue. One locomotive has been constructed at the Southern Pacific Railroad shops at Sacramento, Cal., and equipped with this form of valve motion. It is pulling freight trains, and is doing excellent service. With an average train of 30 loaded cars through the month of May, it made a record of 44½ miles to the ton of coal consumed. An outline cut showing the form of the Stevens' valves also appears on this page.

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NEW YORK, JUNE 30, 1883.

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The Machinery Situation.

In spite of the fact that machine shops are unusually dull, the situation is not one of depression. There are prospects of an increase of shop work in the near future, especially on railroad account, and good crops are likely to induce greater activity in general business after they are harvested. It is said that exhibitors of machine tools at the Chicago Railway Exposition have sold not only most of them there shown, but a large number more as the result of their display. Several new railroad shops of extensive proportions are to be built this year, and must be supplied with tools. Locomotive shops are generally busy with orders for some months in advance, and steel rail mills (which were dull some weeks ago) have stocked up with orders at the low price of $40 a ton, thus insuring their continued running. Ten years ago, when dull times came upon the machinery trade, the policy of keeping shops in operation, and accumulating manufactured stock, was the rule rather than the exception; now, when orders are slack, shops are run fewer hours or a smaller force of workmen is employed. Machinery is not allowed to accumulate in shops where built, and the market is in no danger of being overstocked, as it sometimes is with iron or other products. One reason for this is that improvements are making so rapidly, especially in machine tools, that no builder can say with confidence what styles will be in demand two or three years hence, because meanwhile radical changes are liable to be made.

A New Bureau of Labor Statistics.

The New York State Legislature, during its last session, passed an act providing for the establishment of a Bureau of Labor Statistics something after the plan of the labor bureaus of Massachusetts, Pennsylvania, Ohio and other States, that have already accomplished excellent results in gathering and disseminating reliable industrial information. The act provides for a "Commissioner of Labor Statistics" and a clerk, who are allowed $6,700 a year (besides their salaries,) for the expenses of gathering statistics and making a report to the Legislature which, in view of the extent of the field to be covered, is certainly a moderate appropriation. The Commissioner, Charles F. Peck, has issued the following circular concerning the work in hand:

Chapter 356 of the Laws of the State of New York, entitled "An Act to provide for the establishment of a Bureau of Labor Statistics," was passed and approved May 4th, 1883; and, in pursuance of the requirements of Section 1, the Governor nominated, and the Senate confirmed, the undersigned, as Commissioner of such bureau.

The bureau has been duly organized and is now in active operation, with quarters in the New Capitol Building, at the City of Albany.

In pursuance of the duties imposed by Section 2 of said act, the Commissioner will cause to be sent out at an early day a series of official blanks, to be filled by the person to whom they are sent, and returned to this bureau on or before a specified date.

It is earnestly hoped that all classes of citizens will respond cheerfully, and by a hearty co-operation with the Commissioner assist in accomplishing the great and benign purposes sought to be achieved by the creation of this bureau, in the interest of labor and capital alike.

Correspondence and suggestions bearing upon the elevation of the laboring classes is earnestly invited; the kind offices of the press, in calling the attention of the people to the importance of a prompt and truthful compliance with the provisions of the law and the wishes of the Commissioner, is solicited.

The Commissioner desires it to be distinctly understood that the names of persons filling out blanks, or those who furnish the bureau with information through correspondence, will not be made public; but, on the other hand, will be treated with the utmost confidence; and he appeals to all classes of citizens for a vigorous and industrious co-operation in carrying out Section 2 of the law, which makes it his duty to "collect, assort, systematize and present in annual reports to the Legislature, within ten days after the convening thereof each year, statistical details relating to all departments of labor in the State, especially in relation to the commercial, industrial, social and sanitary conditions of workingmen, and to the productive industries of the State."

The Commissioner says that the people of other States have, for various reasons, failed to respond to questions asked by similar bureaus, especially the first year. Employes have been under apprehensions of disturbing their business relations with employers; some were too modest to answer; and farmers have refused to answer because of a suspicion that it was some covert scheme to obtain a valuation upon their lands with a view to increased taxation. It is hardly necessary for us to say that these apprehensions are groundless.

Manufacturers and others will benefit the public, including themselves, by promptly and fully answering the questions asked by the bureau, on the blanks sent them for that purpose. The Empire State, although first in population, manufactures and commerce, has never before undertaken to collect labor statistics for the benefit of her citizens, as has been done in other populous States. It is to be hoped that the enterprise now undertaken will prove signally successful. New York produces more machinery than any other State, according to the United States census; and if the Commissioner is enabled to give comprehensive statistics of her mechanical industries in his annual report, the bureau will, for this alone, be worth its cost to the people.

Elsewhere in this issue we present some of the mechanical literature brought before the A. S. of M. E. at their Cleveland meeting last week. Fifty-four new members (including Angus Sinclair of the AMERICAN MACHINIST), one associate and one junior were admitted by ballot. This makes the total membership 419. The admissions seem to be confined almost wholly to members. One of the 39 associates and juniors was promoted to membership at the Cleveland meeting. Prof. Sweet, who as the first promoter of this society, was selected to read the first paper at the first regular meeting, presented last week the first foundry paper offered at any of its meetings. The paper will be found on our third page. It is hoped that other foundry papers will follow at future meetings, for the average foundry practice is not up to the average machine shop practice. One of the pleasant incidents of the meeting was the reception of a communication from the Stevens Institute of Technology, announcing that that Institution had conferred the degree of Doctor of Engineering upon E. D. Leavitt, Jr., President of the Society, which is a well-merited honor.

The Exposition of Railway Appliances now in progress in Chicago and which closes Saturday next is a great success mechanically. If there is a deficiency financially the guarantee fund is ample to meet it. Crowds of people have attended every day since the opening, and the amount of valuable information spread in railway mechanical circles is beyond computation.

On another page we publish Angus Sinclair's second letter from the Exposition, in which he mentions some of the distinguishing features of certain articles on exhibition, together with other incidents of the display.

The credit of originating the Exposition enterprise is due to E. H. Talbott, President and General Manager of the *Railway Age*.

Some of the Western cities, notably Cincinnati, having been giving special attention for the past two or three years to smoke-preventing devices, apparently without any great measure of success, have finally come to the sensible conclusion that the fireman has more to do with the matter than anything else. They will probably move for a smoke-preventing fireman—no patent, but good pay.

Railroad Passage Rates.

The new law fixing maximum passenger fares at 3 cents per mile has gone into effect in Kansas. Discussion has already arisen as to the railways' rights under the new law to quote special rates to clergymen, commercial travelers, visitors to fairs or excursionists. The statute reducing the rate also forbids discrimination, and lower rates to the classes named might be considered discrimination. The drawing of lines on "discrimination" has always been a stumbling block with legislators.—*Railway Review.*

We should like to be informed by the *Railway Review* or any other journal making an outcry against "the drawing of lines" forbidding railway freight and passenger rate discriminations, why clergymen, commercial travelers or any other special class of individuals should be allowed to travel by rail cheaper than farmers, horse jockeys or men of any other occupation? Railway companies are public carriers by virtue of their charters granting them extraordinary privileges in consideration of serving the public fairly without doing injustice to anybody. What moral right have they to demand a higher fare from a farmer or a mechanic than from a clergyman? Are clergymen entitled to travel at reduced fare because of any special service they render the railroads? If so, not only would we be glad to know the facts, but the whole public would be also. Yet we do not blame anyone for accepting cut rates if offered.

No valid objection can be made to excursion rates provided they are open to all who wish to avail themselves of the reduction from regular rates "Thousand-mile tickets" (which are available for commercial travelers as well as others) are sold by some of the railroad companies below full rates to those who do a great deal of traveling. The reason for this kind of reduction is plain enough without argument. If such tickets are for sale to everybody who wishes to buy them no injustice is done, but if they are disposed of only to people of certain specified occupations those travelers excluded from buying them have a right to complain. And the duty of legislators is to guard against public injustice.

Trump Cards.

The Engineer and Iron Trades' Advertiser, of Glasgow, Scotland, after noting a recent paragraph of ours mentioning that U. S. Consul E. G. Van Riper, at Moscow, feels greatly encouraged over the prospect of making his office an important aid to the advancement of American industrial interests in Russia, says: "English machine makers will be wide-awake and play trump cards." Heretofore they have taken nearly every trick, but with a new deal they will probably discover that American machine makers hold a few trumps and know how to play them.

Literary Notes.

THE MATERIALS OF ENGINEERING. In three parts. Part II.—Iron and Steel. By Robert H. Thurston, C. E. New York: John Wiley & Sons

We are indebted to the publishers for Part II. of the above work. We have already noticed Part I. The present volume is divided into eleven chapters. The first chapter treats of Qualities of the Metals; the second, of the History, Principles and Materials of Metallurgical Work. The third chapter gives a historical sketch of iron manufacture. Then follow chapters on the ores of iron, reduction of ores, production of cast iron, manufacture of steel and wrought iron, chemical and physical properties of iron and steel, strength of iron and steel as ascertained by actual test, effect of temperature and time on resistance, flow of metal, fatigue; concluding with Chapter XI., treating of specifications, tests and inspection. The service of Prof. Thurston on the United States Government Board, appointed to test iron and metals, renders him exceptionally well qualified among eminent mechanical engineers to prepare a work of this character. The book is handsomely gotten up, and contains 675 pages, with numerous illustrations.

We are in receipt of a brace of books for review, from the publishers, Fowler & Wells, 753 Broadway, New York. One is entitled "The Natural Cure," by C. E. Page, M. D., author of "How to Feed the Baby." As the persons and families of our staff are all re-

markably healthy at the present juncture, we should be unable to notice the work with any degree of unction in our editorial pages, even if curing diseases and feeding babies were in our line, as conductors of a mechanical newspaper. We shall therefore forbear further comment on the work in question.

As the remaining publication entitled, "Tobacco: Its Effects on the Human System" relates likewise to a subject outside the scope of our editorial columns, we have turned over the book to one of the members of our staff, who consumes an average of ten to twelve cigars per day. Judging from the appearance of the illustrations on the front cover of the pamphlet, this book will reform him, if anything can.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(224) J. R., Albany, N. Y., asks: What is steam metal? *A.*—Steam metal is strong brass or bronze that is well calculated to stand the action of steam.

(225) A. L. W., New Haven, Conn., writes: I want to get 15-horse power on a parallel shaft 100 feet from the main shaft, such shaft to run at 275 revolutions. What diameter rope and pulley should I use? *A.*—We cannot, from experience, recommend wire rope at the speed indicated. We should suppose that pulleys 5 feet diameter, rope 7-16" diameter, would be about right. With reference to its successful use at that speed, you had better consult those who deal in such supplies.

(226) A. G. C., Chicago, Ill., asks: Can you give me any plan whereby I can get a diagram from a rotary engine with a Thompson indicator? *A.*—You cannot get a very satisfactory diagram with a reciprocating drum. The drum should revolve with the shaft. You might, by a little study of the subject, translate the diagram you get with the Thompson indicator into a regular diagram, by measuring pressures and distances, and so establishing points through which to draw the lines of a new diagram. The process would, however, be somewhat tedious.

(227) T. P., Amprior, Ont., writes: We have a large furnace for burning saw-mill refuse. Last year the smoke-pipe, 75 feet high and four feet in diameter, was placed directly over the furnace, but owing to danger from sparks, the pipe has been moved 250 feet away from furnace, to which a connection is made with a pipe of same diameter. Since making the change, the draught is very poor. Is there any way to increase the draught, and use the present arrangement? *A.*—We understand your connecting pipe is horizontal. It should have been inclined upward, say, one foot in fifteen feet. If your pipes are tight, we do not see any very practical way to increase the draught, unless you increase the height of your vertical pipe.

(228) L. K., St. Louis, Mo., writes: I have what I believe to be a very valuable idea for the construction of a rotary engine, but there are one or two points upon which I am not entirely clear. The principal ones are: 1. Will the same considerations which are used in proportioning the ports of the reciprocating engine apply to the rotary engine, and if not, why not? *A.*—The same considerations will not apply. In the reciprocating engine the piston stops at each end of the stroke, and this stopping and comparatively slow motion immediately after it starts affords time for the admission of steam to fill the clearance space. Similarly time is afforded for exhaustion. That which is so often condemned in the reciprocating engine, viz., the unequal speed at which the piston moves is really one of the things that insure its success. In the case of the rotary engine, steam must be admitted and exhausted under full piston speed. Hence, to do this with the same measure of perfection as is done in the instance of the reciprocating engine, the ports must be enormously large. 2. What is there in the way of making a rotary engine that shall be as successful as a reciprocating engine? *A.*—For reasons just stated, it is difficult to provide for satisfactorily getting the steam in and out of the cylinder of a rotary engine. Besides this, packing the piston of a rotary engine presents grave mechanical difficulties.

(229) J. N. O., Chicago, Ill., writes: We are running a plain, double-valve, old style throttling engine, 12"x36". The engine runs at 75 revolutions, boiler pressure, 75 to 80 lbs., and is doing about 45-horse power work. The steam pipe is 3" diameter and 40 feet long, covered with asbestos. We are soon to put in an automatic cut-off engine, 12"x24", to run at 120 revolutions. The parties who furnish the new engine insist that we put up a 4" pipe in place of the present 3" one. What I cannot understand is, why, since the new engine is to be put in to save steam, a larger pipe should be used. In other words, why is a *larger* pipe required to pass *less* steam? *A.*—With the new engine you will need to pass more steam in equal time than with the old engine. With the old engine the valve is open, probably, for ¾ of the stroke, during which time steam passes through the pipe and into the cylinder. The new engine will cut off at less than ¼ stroke, after which the flow of steam is stopped until the beginning of the return stroke. Furthermore, in the old engine the steam is throttled down twenty or thirty pounds, and a little of this throttling may be done in the pipe, perhaps without much, if any, loss. With the automatic engine, the principle is to admit the steam to the cylinder as near as practicable at boiler pressure, so as to get the full advantages of expansion. The quantity of steam required in a steam engine has less to do with the dimensions of steam pipe required than the way in which it is used. Either the 3" or 4" pipe would undoubtedly *pass, in some way*, several times as much steam as your boiler would make.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

James W. See, Consulting Engineer, Hamilton, O.

A. Wilkinson, expert steam engineer, Manayunk, Philadelphia, Pa.

Chas. T. Porter, Mechanical Engineer, Tribune Building, (Room 42,) New York City.

Patents.—Franck D. Johns, Att'y at Law & Solicitor of Patents, 617 Seventh St., Washington, D. C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

For sale, 25" lathes of best designs from new patterns. George A. Ohl & Co., E. Newark, N. J.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Consulting Engineer and Mechanical expert, C. C. Hill, 144 LaSalle street, Chicago, Ill.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

H. E. Penney, manufacturer of Steel Spring Cushioned Helve Hammers. Photo and circular on application. Minneapolis, Minn.

New tool chest, price $10. See description in AM. MACHINIST, April 14th, or send for circular. Goodnow & Wightman, 176 Wash'ton st, Boston, Mass.

Castings furnished for 18" and 21" swing engine lathes. Gearing turned and cut if desired. C. F. Batt, Phœnixville, Pa.

How to reach 40,000 prominent "*Steam Users*" in the United States. Send for our circular. The J. N. Mills Publishing Co., 175 Broadway, N. Y.

Speed and drill lathes, 10"x4', new design. Self-clamping rest, first-class material and work. Parties about to buy will do well to inquire. C. Wing, Greenfield, Mass.

"Patent Binder" for the AMERICAN MACHINIST holds 52 weekly issues in good shape. Sent to any address by mail for one dollar. American Machinist Publishing Co., 96 Fulton street, New York.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant. $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Free—"Useful Hints on Steam." A book of 96 pages, illustrated. Valuable to engineers, steam users and those about purchasing steam machinery. By mail, 15 cents, or free on personal application. E. E. Roberts, 107 Liberty St., New York City.

Cheapest, strongest, most simple, compact, durable, effective and economical steam pump in the market. See list of prices in this column next issue. No machinery, no oil, no special care. Can be worked suspended by a chain. Pulsometer Steam Pump Co., 83 John street, New York.

The National Feed-Water Heater—the best and cheapest in the market; warranted to heat water by exhaust steam up to 206° to 212° Fahrenheit. This heater commends itself to every practical man. For description and prices, apply to the National Pipe-Bending Company, New Haven, Ct.

Twenty Years with the Indicator. By Thos. Pray, Jr., Editor Cotton, Wool and Iron, royal 8vo, 162 pages, 87 illustrations, printed on heavy toned paper. Bound in muslin, beveled edges. Price, $1.50. Sent postpaid to any address, on receipt of price, by the Boston Journal of Commerce Publishing Company, Boston, Mass.

Wanted—Correspondence with engine builders, boiler makers, and supply dealers in steam goods. We manufacture the *cheapest* injectors and best Steam Jet Pumps in this country, and offer to *live men* the most liberal terms ever named. Drop postal for particulars to J. B. Sheriff, Son & Co., 68 Water St., Pittsburg, Pa.

For a strictly first-class automatic engine, from 10 to 60 horse-power apply to the Straight Line Engine Company, Syracuse, N. Y.; medium or high-speed; perfect balance; fewest parts and fewest working joints; uniform speed at all ranges of power or steam pressure; the best material and workmanship in all vital parts; the most correct distribution of iron; unexcelled in smooth running.

Now ready for delivery, volume 5 of the AMERICAN MACHINIST, comprising the year 1882, (52 issues) complete with index, in substantial book form. Also a few remaining of volumes 3 and 4 comprising the years 1880 and 1881, can be sent anywhere by express. Price of each volume, $4.00; express charges to follow. AMERICAN MACHINIST Publishing Company, 96 Fulton street, New York City.

Chordal's Letters.—John Wiley & Sons, 15 Astor Place, New York, have now ready a new and enlarged edition, with six additional plates, of Chordal's Letters, comprising the choicest selections from the series of articles entitled "Extracts from Chordal's Letters," which have appeared in the columns of the AMERICAN MACHINIST; with a steel portrait of the author, and upwards of fifty original illustrations by Chas. J. Taylor. One volume 12 mo. of nearly 400 pages, cloth, $2.00. Will be mailed and prepaid on the receipt of the price.

MANUFACTURES.

A cotton mill on Twelve-mile Creek, S. C., near Lexington, is soon to be built.

W. C. Young & Co., Worcester, Mass., are getting up a new cutting-off machine.

The Page Belting Co., Concord, N. H., are to extend and enlarge their works.

Kranich & Bach, Twenty-third street, New York are about to put in three new boilers.

The Link-Belt Machinery Company, of Chicago, are making 8,000 feet of link-belting to go to China.

The $250,000 necessary for the erection of a 10,000-spindle mill at Darlington, S. C., has been secured.

White, Potter & Page's planing mill, Willoughby avenue, Brooklyn, are about to put in three new boilers.

The site of the new cotton factory at Cedartown, Ga., will embrace twenty acres, and work on the building has commenced.

The New York, New Haven and Hartford Railroad will erect a new round-house at Hartford during the coming season.

The Memphis (Tenn.) *Avalanche* says that another cotton-seed-oil mill, the Planters', with a capital of $100,000, has been organized there.

The cotton-mill boom has reached Spartanburg, S. C, and it is now proposed to build a factory there, to be run by steam power.

The Lewis Foundry and Machine Company (Limited), Pittsburgh, Pa., are erecting an additional 12-ton air furnace in their malleable iron foundry.

Three weeks will complete the freight car shops of the Pullman Company at Pullman, Ill. When in operation they will have a capacity of forty cars per day.

The foundry for the Shackelton Steam Heaters, in South Lawrence, Mass., is rapidly pushing towards completion, and excavating for the machine shop has begun.

Humlong & Carmean, carriage manufacturers, Marshalltown, Ia., will erect a shop addition, 40x108 feet, two stories high, to contain a lot of new machinery.

The new president (Charles Parsons) of the Rome, Watertown and Ogdensburg Railroad has just bought $100,000 worth of new steel rails, which are to be laid on the road as soon as possible.

The St. Louis *Railway Register* says: The Lafayette Car and Wheel Works Company has just closed a contract for manufacturing two thousand cars for a New York City railway company.

The contract has been given for plans and specifications for a new cotton mill at Florence, S. C., $116,000 having been raised for the purpose. The factory will have 10,000 spindles, run by steam power.

The Bramble Lock Company, of Terre Haute, Ind., with a capital stock of $20,000 has been incorporated. The directors are Robert Hervy, John Berry, Frank McKeen, Crawford Fairbanks and Ray Jenckes.

O. Colborne, Chicago, Ill., manufacturer of shafting, hangers, pulleys and general machinery, has increased the capacity of his works by an addition of 40x20 feet. He has also added new machinery, and is full of orders.

The Newark and Bloomfield Horse Car Company, Newark, N. J., have erected a small building in which to make their own tools and repairs. They will put in a Wright engine and boilers, the latter being fed by a No. 3 Korting injector.

J. A. Field & Co., St. Louis, Mo., have recently greatly enlarged one of their machine shops and put in several pieces of new machinery, including a large lathe and planer. They have had eight foreign orders since this year began.

The Richmond (Ind.) Foundry Company has been incorporated under State laws. The capital stock is $25,000, and the directors are Charles F. Coffin, Joseph Marchant, Charles H. Coffin, Turner W. Hayes, Wm. F. Spencer and Wm. C. Shoemaker.

The Michigan Malleable Iron Company, Detroit, reports that the demand for its malleable iron has increased to such an extent that it has about decided to shut down its gray iron shop, which it has been running since it first started, and devote all its time and space to the manufacture of malleable iron castings to order.

W. H. Eddy, Worcester, Mass., is building an automatic machine for making coach or lag screws at one operation; also a machine for threading bolts and rounding the points. Orders were given for these machines after looking over Mr. Eddy's designs upon paper, as none of the machines have heretofore been built.

Samuel Webber, of Manchester, N. H., who is New England Commissioner for the Louisville Exposition, has secured from the manufacturers of textile machinery in that section a full line of exhibits, including everything used in manipulating cotton from the bale to the loom.

The Fall River (Mass.) Iron Works will put in a new double Corliss engine of 350-horse power, one side of which will run the puddling department and the other the plate mill. The old engines will be taken out and a new foundation laid. During the changes a general overhauling of the machinery in the puddling department will be made. The alterations will require some six or eight weeks.

At the first meeting of the Portsmouth (N. H.) Machine Company, the capital stock was fixed at $100,000, all of which has been subscribed. The company organized with Frank Jones, president; W. H. Hackett, clerk; and C. H. Mendum, treasurer, and will build a two-story brick machine shop, 204x72½ feet, on the site of the burned Kearsarge mill.—*Boston Commercial Bulletin.*

Fowler Brothers, of 15 State street, New York, are putting up at Weehawken, N. J., an irregular-shaped building, three stories high and of a capacity about equal to 200 feet square. It will be a "cold storage" warehouse. They will use three Rankin ice and absorption machines. Twenty thousand feet of pipe extend throughout the building. Wright, of Newburgh, furnishes the boilers and engine. The former will be fed by a Korting injector.

We recently called on Boynton & Plummer, in their new two-story brick shop, opposite the junction depot, Worcester, Mass. The demand for their blacksmiths' drills, bolt cutters and shapers is very fair. They have systematized the process of manufacture so that nothing is carried about the shop more than is necessary. When a piece leaves one workman, it is passed to the next, who is within easy reach to receive it. They are now getting out a new ten-inch-stroke shaping machine.

The business men of Rich Hill, Mo., have taken steps to establish a flax mill in that town, for the manufacture of tow, bagging, twine, etc., both to increase the business of the city and to benefit the farmers of the county by the utilization of a large amount of flax fiber that is now every year allowed to go to waste. Considerable flax is grown in that vicinity for the seed alone, the straw being left on the ground to rot, or burned up. It is thought that the mill contemplated will use up $20,000 worth of flax straw the first year, and double that amount the second year.

The McKenney Tubular Rail Company, of Chicago, are erecting mills at La Grange, Lewis Co., Mo. The rail mill will be 238x90 feet, and the blacksmith and machine shop building 170x35 feet. An addition to the latter will be the roll-lathe room, 20x14 feet. One hundred tons a day will be the capacity. The works are expected to be ready by the first of next July. The city furnishes the company the buildings and machinery free, as a bonus for locating the works at that point, and is ready to furnish liberal inducements for other manufacturing establishments locating there.

The foundation is in for the Corliss Safe Manufacturing Company's new works, Providence, R. I. The total length of the machine shop will be 467 ft. 4 in. The center portion, 174 ft. 8 in. long, will be 69 ft. wide, and each end will be 58 ft. 4 in. wide. A building in the rear, 137 ft. by 52 ft. 8 in., will be occupied by blacksmith shop, boiler house, grinding room, woodwork room, etc. The engine room will be placed beside the boiler house, connecting the two buildings. The location is beside the tracks of the New York, Providence and Boston Railroad, from which a switch track will enable cars to be run alongside of or into the building.

The Davidson Steam Pump Company, Brooklyn, N. Y., have recently erected a pumping engine for the Knoxville Water Company, of which Mr. Lowerie, the superintendent, writes as follows: "We take great pleasure in testifying to the perfect and successful starting of the double-plunger compound condensing pumping engines, 1,500,000 gallons capacity, furnished our company. They are now raising water 181½ feet from the river, and delivering easily 1,000 gallons per minute into reservoir about 215 feet higher and 2,500 feet distant. The moment steam was supplied they moved off quietly, and are now working beyond guaranteed speed as smoothly as any steam engine. We cordially commend your pumping engines to any or all." The dimensions of these engines are: Steam cylinders, 18" and 34" diameter; water cylinders, 16" diameter; stroke, 24".

Among the patents issued on June 5th, 1883, were twenty patents on scales, gauges and testing machines, issued on the application of A. H. Emery, the inventor of the Watertown testing machine, to the Emery Scale Company, which company is owned and operated by the Yale & Towne Manufacturing Company, of Stamford, Conn. The scales, gauges and testing machines embody the same principles as the great Emery testing machine at the Watertown arsenal. The scale and gauge are now on exhibition at Chicago, as will be seen from our notes published in another column. The manufacturers hope to have a testing machine there before the close of the Railway Exhibition. Similar patents were issued simultaneously in England, France, Germany, and all important Continenta countries, as well as in the principal English colonies.

Machinists' Supplies and Iron.

Prices generally steady for machinists' and engineers' supplies. No improvement in demand for pig iron but the price of No. 1 is higher, and in some cases $2 a ton advance has been refused. No. 1, $21 to $22.50; No. 2, $19. Scotch pig is offered at last week's prices. The market for manufactured iron is stronger, at unchanged prices. Lake copper sells at 15c. to 15¼c. Lead, 4¼c., jobbing price for both common and refined. Banca tin, 22¼c.; Straits, 21¾c.; Australian, 21¾c. Silesian spelter, 5¼c.; domestic, 4¾c. Antimony, 9¾c. for Hallett's and 10⅜c. for Cookson's.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted—A first-class mechanical draughtsman wishes a position for the summer. Address, A. R. Nuncio, South Bethlehem, Pa.

Wanted—Situation by a stationary engineer, who is also a competent pipe fitter. Address, Z. Y. X., care AM. MACHINIST.

Wanted—A first-class machinist. Steady work to the right man. Address, W. W. Oliver, Buffalo, N. Y.

Wanted—Position by a mechanical draughtsman, familiar with engine, boiler and foundry work. Address, G., Box 8, AM. MACHINIST.

Wanted—A first-class brass moulder. Must be steady and reliable and capable of taking charge of foundry. State experience and salary expected. Apply, P. O. Box 2610, Toronto, Canada.

Draughtsman, of theoretical and practical knowledge and long experience in the construction of marine engines and engine work in general, is open for engagement. Has superior ability within this line. Address, Draughtsman, care AM. MACHINIST.

Wanted—Two boiler makers, thoroughly competent to do all kinds of repairing, sober and steady. Married men preferred. Steady job. $3.00, $3.50 per day. $3.50 to first-class men. Board here, $3.00 to $5.00 per week. Three-room house, $7.00 to $10.00 per month. No correspondence. First come first served. Dallas Iron Works, Dallas, Texas.

For Sale—Twenty-one newly-bound volumes of *Engineering*. Address, Books, AM. MACHINIST office.

Light and fine interchangeable machinery to order. Foot and power lathes; slide rests, &c. Catalogue for stamp. Edwd. O. Chase, Newark, N. J.

Wanted—Catalogues and price-lists of good mechanic and boiler-makers' tools. Critchley & Whaley, Portsmouth, N. H.

Wanted—A set of pulley patterns, correct sizes; also a set of skene arms, in good condition. Address, Wm. Osborne, Malster, Barton street, Hamilton, Canada.

Wanted—To exchange iron working planers or shapers for a first-class engine of 40-horse power. Address, The Hendey Machine Co., Torrington, Conn.

Correspondence is desired with boiler makers who will take up with the manufacture of a first-class style of boiler as a specialty. Address, M. J. H., care AM. MACHINIST.

Wanted—Special machinery and tools for manufacturing hangers, shaftings, pulleys and couplings. Send estimates and catalogues, W. H., care AM. MACHINIST office.

Wanted—Special machinery to manufacture; have pattern shop, foundry and machine shops; parties having machinery made by contract will find it to their advantage to correspond with us. Shultis & Co., Kingston, N. Y.

For Sale—One-half interest in a good machine shop, located in a splendid town of 10,000 inhabitants. Machinist or foundryman, with $3,000 ready cash, will find it to his interest to investigate. Address, box 2,045, Ottawa, Ill.

Wanted—Iron moulder, as partner, with $5,000, to start a moulding shop with my machine shop. Have been in business 20 years, and doing now a good business. *Correspondence Solicited.* Address, C. A., care AM. MACHINIST, 96 Fulton street, New York.

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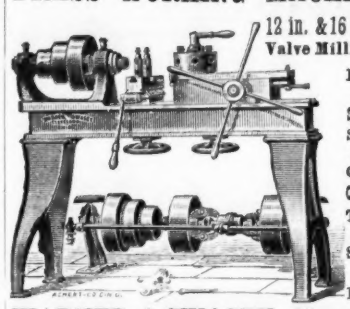
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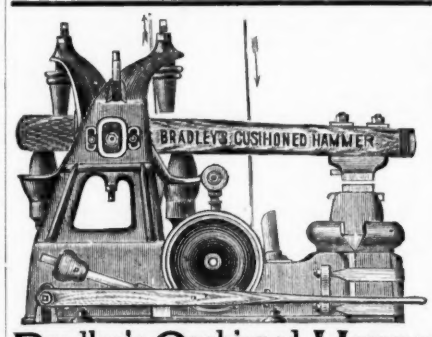

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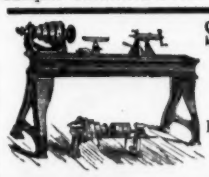
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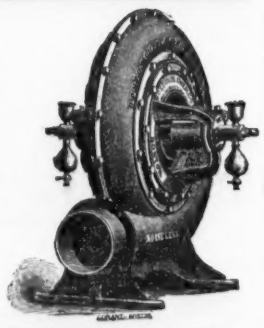

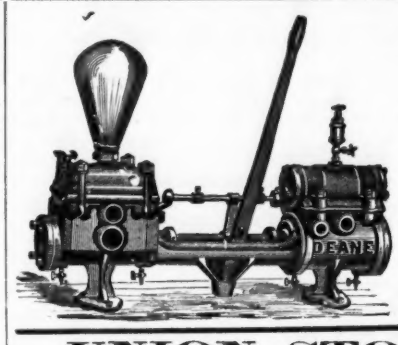

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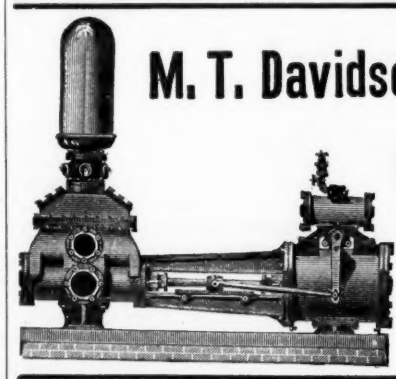
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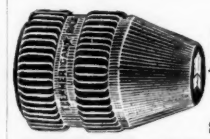
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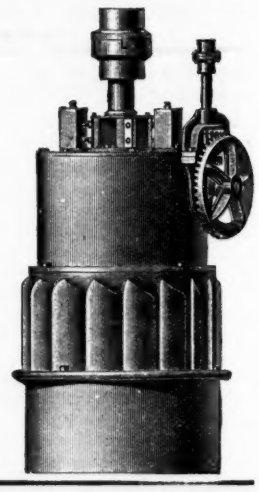

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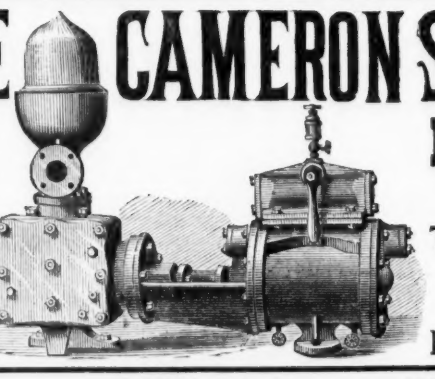
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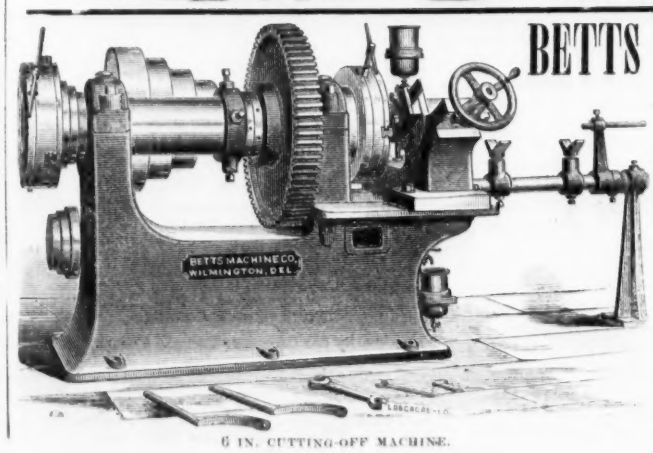

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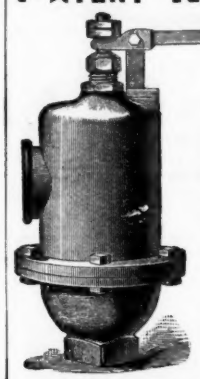

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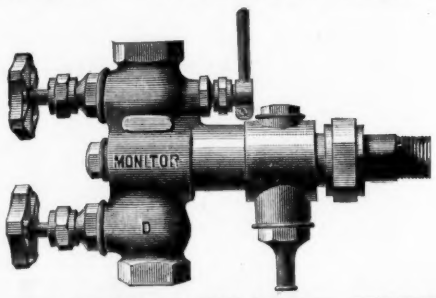

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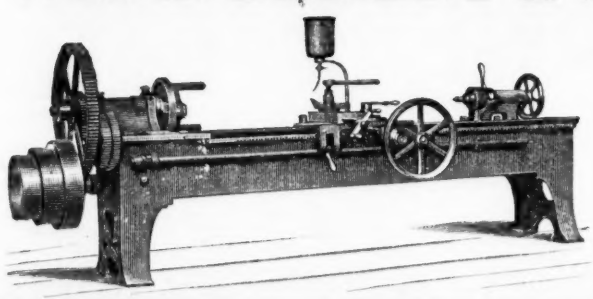

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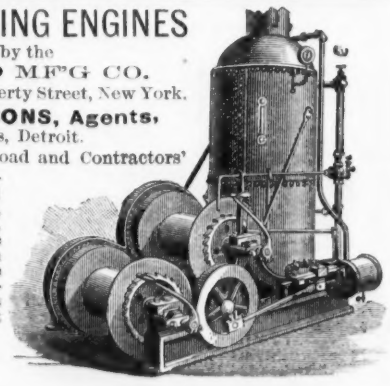

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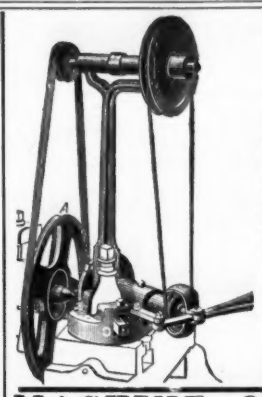

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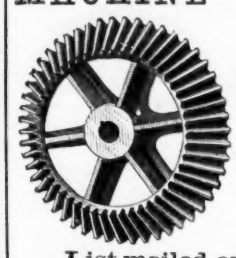

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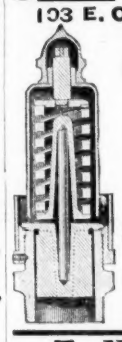

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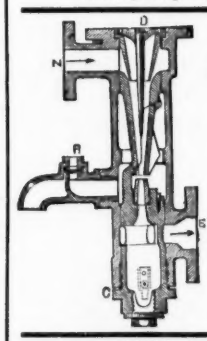

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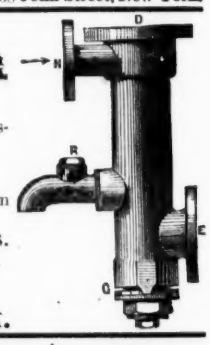

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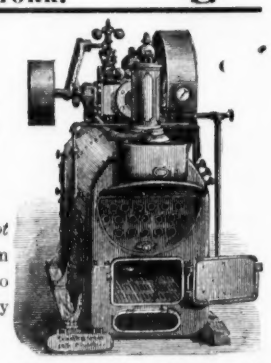

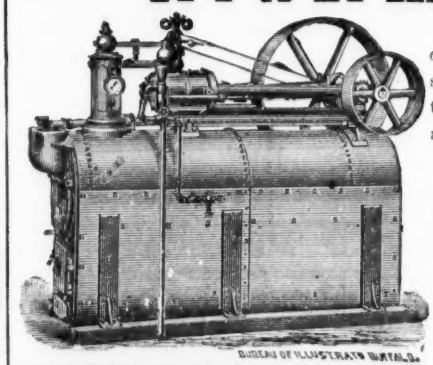

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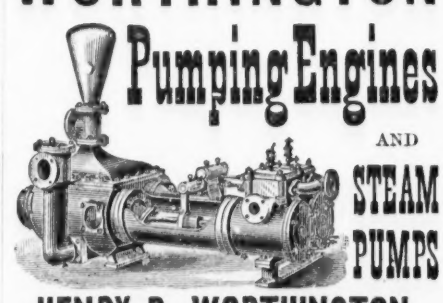

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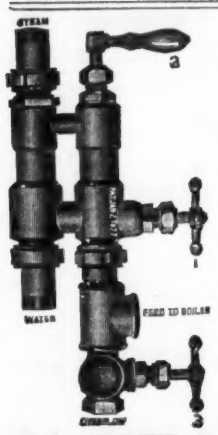

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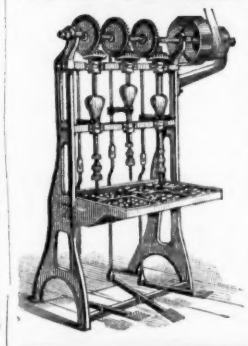

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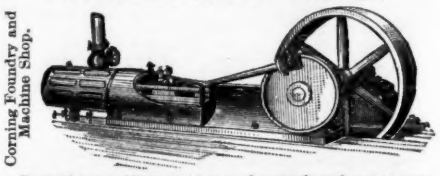

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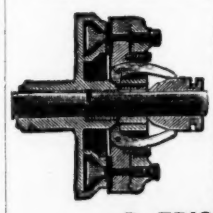

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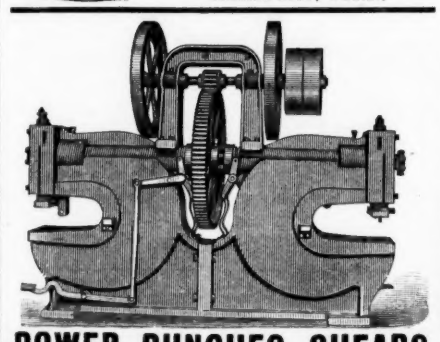

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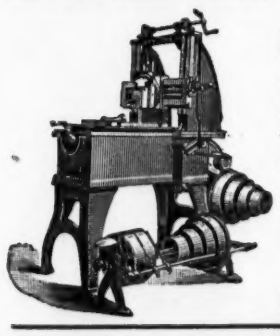

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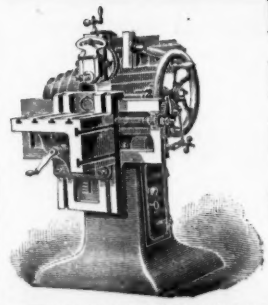

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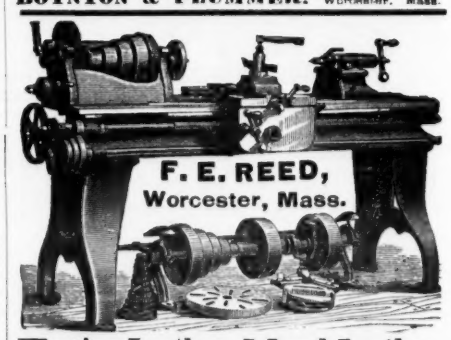

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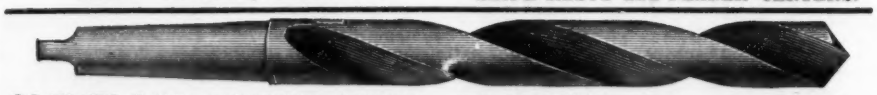

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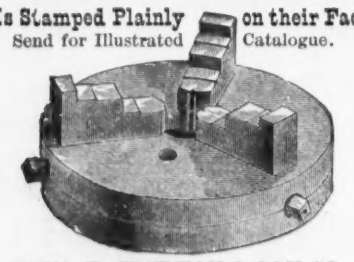

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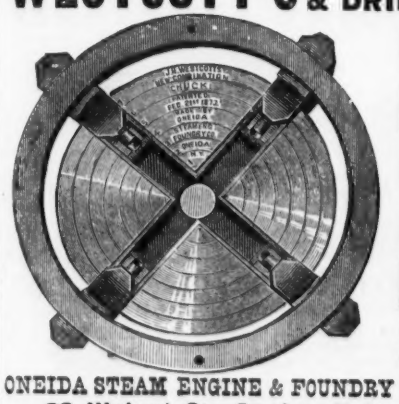

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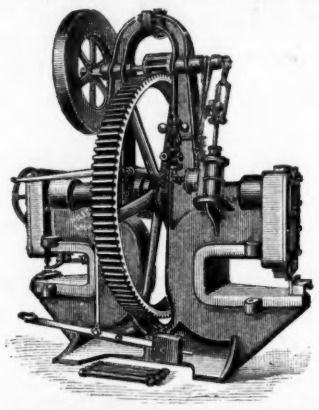

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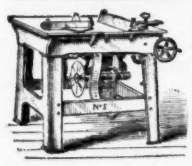

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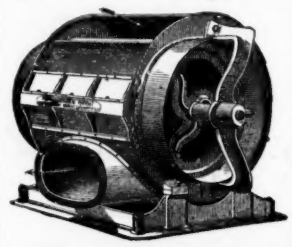

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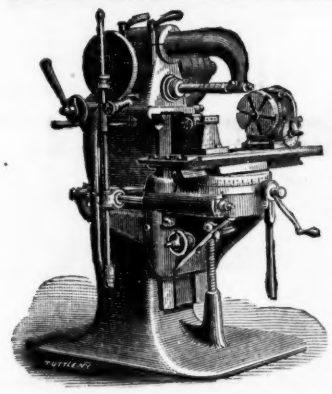

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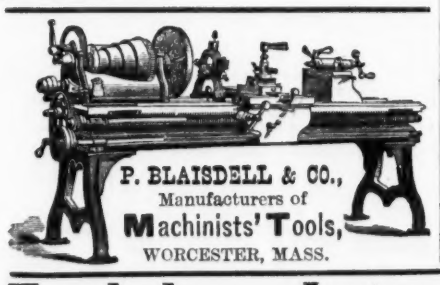

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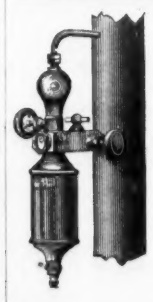

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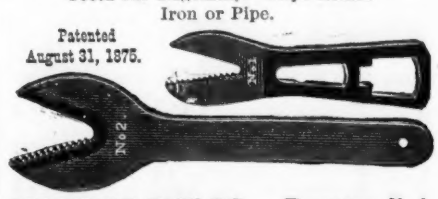

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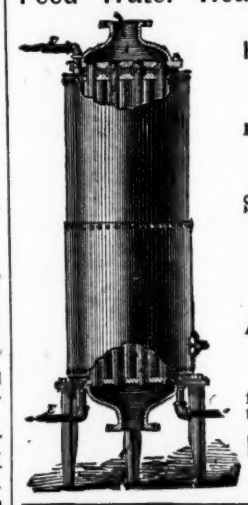

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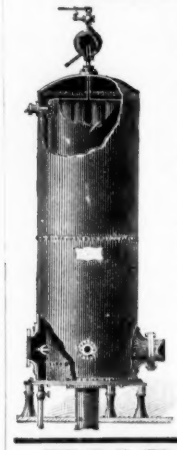

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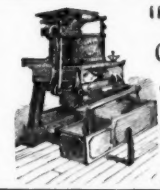

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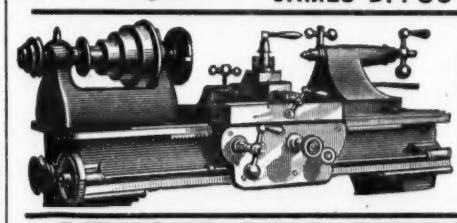

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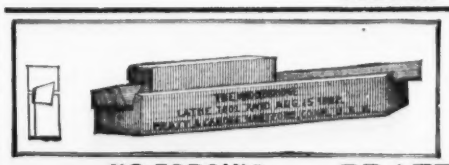

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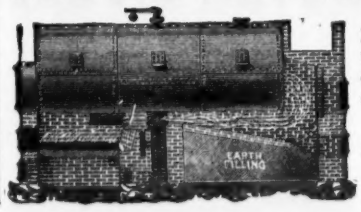

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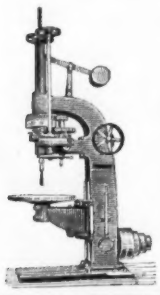

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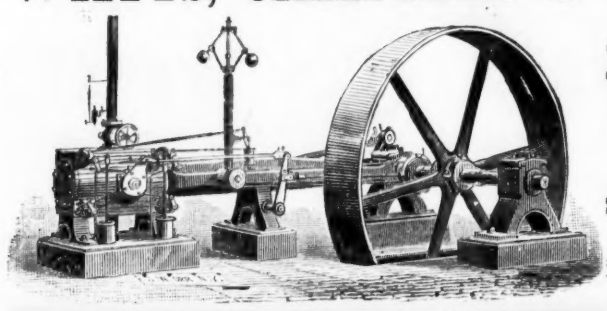

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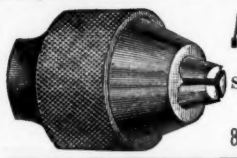

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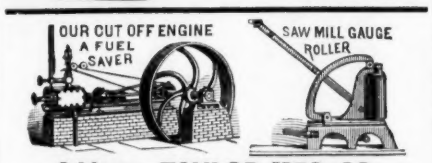

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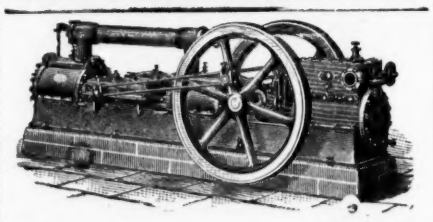

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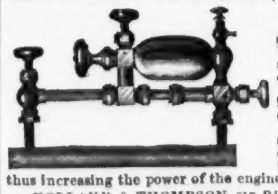
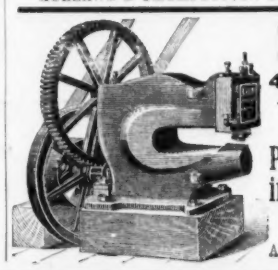


Is guaranteed to be 1. A perfect insurance against the cuttting of Valve-seats, Cylinder and Governor Valves of the engine. 2. It will pay for itself in 6 months' in savings of oil, coal, and packing. 3. It will insure more speed ... the revolutions of the engine, say from 1 to 2 strokes per minute, thus increasing the power of the engine. Manufactured by

HOLLAND & THOMPSON, 217 River St., Troy, N. Y.



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BROOKLYN, N. Y.

Manufacturer of

Punching, Shearing and Riveting MACHINES,

Also, Plate Bending Rolls.

DREDGES

guaranteed to excavate 50 per cent. more material from hard bottom than any other machine.

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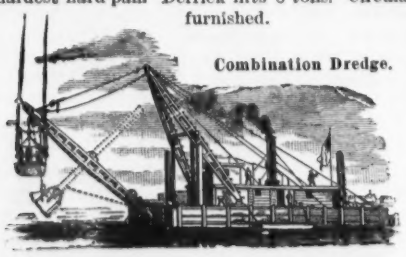
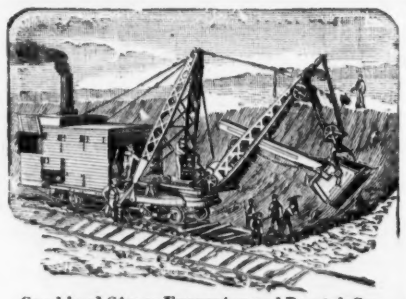
has a capacity of 4 cubic yards per minute in gravel. Has proved very efficient and desirable in the hardest hard-pan. Derrick lifts 8 tons. Circulars furnished.



Combination Dredge.



Combined Steam Excavator and Derrick Car.

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ALBANY, N. Y., Patentees,

Successors to RALPH R. OSGOOD, Troy, N. Y.

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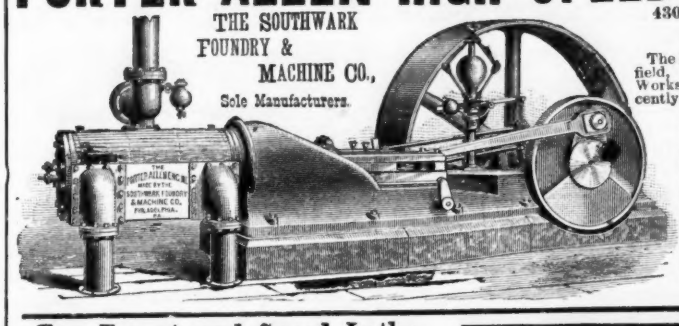
THE SOUTHWARK FOUNDRY & MACHINE CO., Sole Manufacturers.



The Springfield Iron Co., Springfield, Ill., and The Otis Steel Works, Cleveland, Ohio, each recently ordered their THIRD Porter-Allen Engine. The Cambria Iron Co., Johnstown, Pa., have put in, during the past year, their EIGHTH Porter Allen Engine, being 100 H. P. to run electric lights. The first Porter-Allen plant put in these works, six years ago, for rolling mill purposes, with same boilers and engines relatively equivalent to the former, doubled the output of the Works.

Fox, Turret and Speed Lathes

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Swivel Head Engine Lathes,

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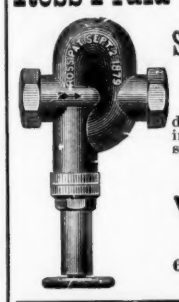
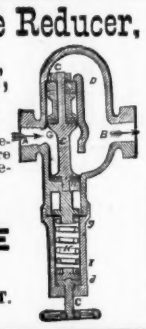
Steam, Water, Air and Gas.





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For Superiority in Drilling Soft or Hard, Thin or Thick Metals use the

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For Lathe Work it is unexcelled. In boring, counterboring, reaming, or to countersink, the highest testimonials are given. Made by

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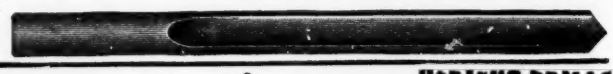
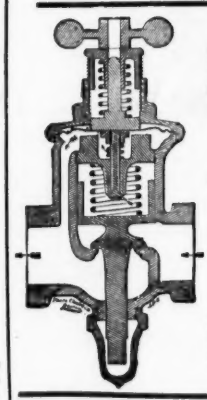
Holds from 0 to ½ and 0 to ¾

No Key or Wrench Required.





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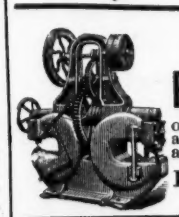

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KORTING CONDENSER.

For Steam Engines and Pumps.

Requires no Air Pump and no foundations. Only 15 ft. height of water required from level of water supply to discharge pipe, instead of 34 ft., whether above or below engine cylinder. Has fewer parts, and is lower in price than any other condenser. Send for circular giving full information.

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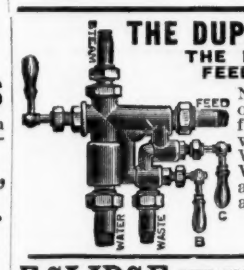

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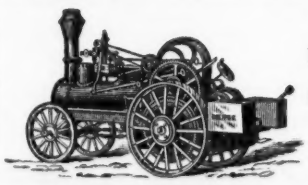

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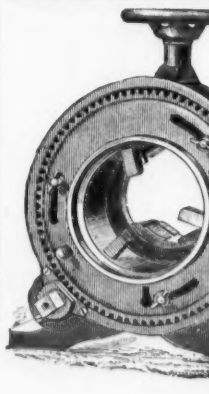

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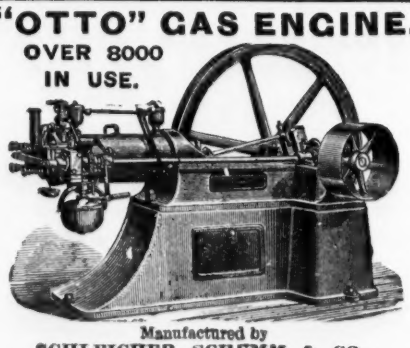

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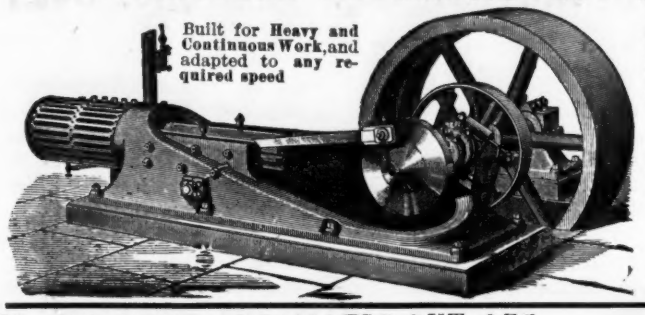

Built for Heavy and Continuous Work, and adapted to any required speed

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Trade circulars and practical treatise on Steam Engineering free by mail.

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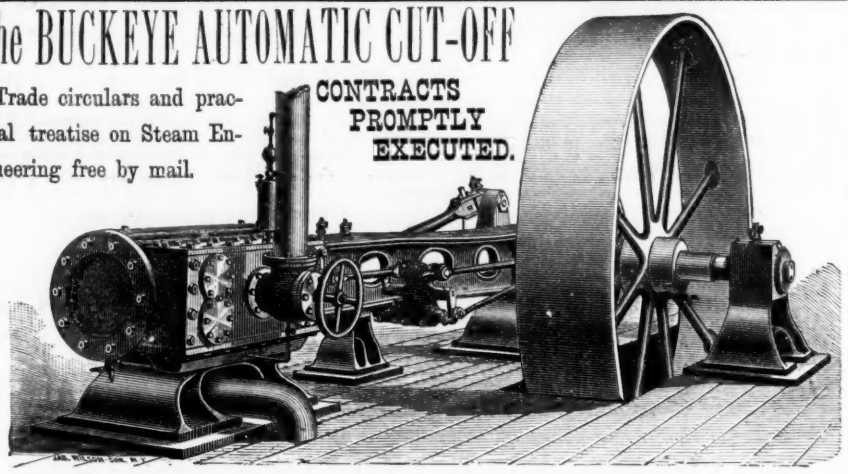

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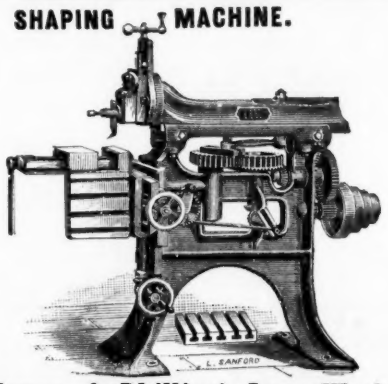

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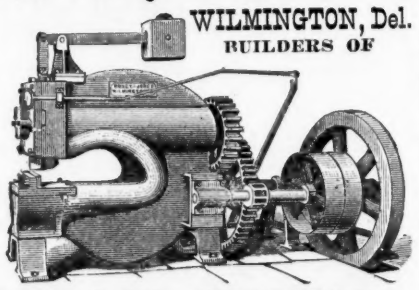

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14" ENGINE LATHES OF NEW DESIGN
guaranteed to be equal in material, design and workmanship to the best ever offered.

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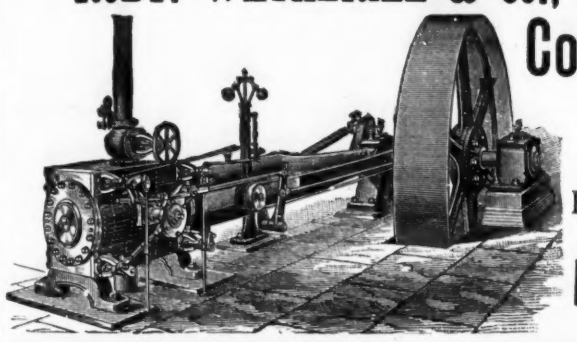

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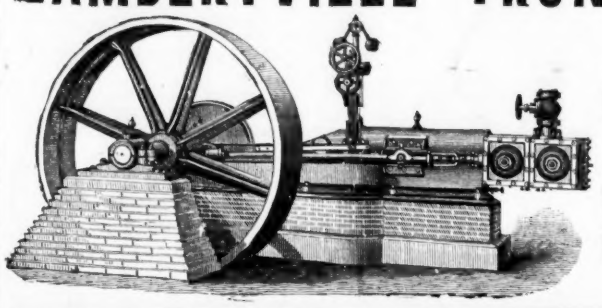

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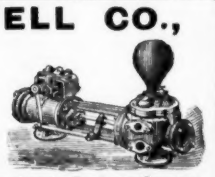

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1 each " " 26 in. x 9, 12 & 14 ft. Grant & Bogert.
1 " " 45 in. x 15 ft. Good Order. [New
1 " " 36 in. x 12, 17 ft. New.
1 " " 15 in. x 6 ft. New
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1 " " 16 in. x 6, 7 & 8 ft. "
1 " " 18 in. x 8 & 10 ft. Lodge & Barker"
1 each Engine Lathes, 20 in. x 10 and 12 ft,
1 " " 24 in. x 10 ft. New.
1 " " 28 in. x 18 ft. New.
1 " " 24 in. x 12, 14 and 16 ft. New.
1 " " 11 in. x 4 ft. & 5 ft. Prentiss. New.
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" " 30 in. x 30 in. x 8 ft. 2nd Hand.
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Full assortment Milling Machines, Spindle Drills, &c., of Garvin's.
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The Most Perfect Governor Known.

RUNS IN OIL.

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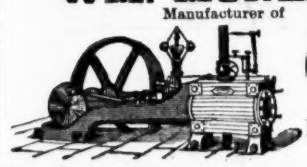

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Manufacturer of
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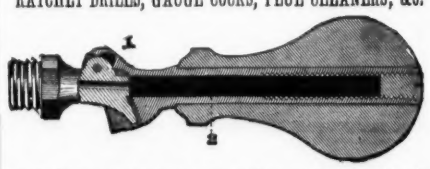
RATCHET DRILLS, GAUGE COCKS, FLUE CLEANERS, &c.



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We have the following second-hand Machinery for sale, viz.:

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One Planer to plane 15 ft. long 51" wide verygood.

One Iron Planer, to plane 12 feet long, 36 in. x 32 in. in fair condition.

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One Engine Lathe, will take 14 feet between centers, and swing 53 in over ways, has hollow spindle, and is adapted for both turning and boring, with countershaft. Complete.

One Engine Lathe, will take in 11 feet, 6 inches between centers, swings 48 inches over shears, and 32 inches over carriage. It has internal gear, and cross-feed, with countershaft. All complete.

One 3 ft bed, 9 in. Foot Power Screw Cutting Lathe, with tools.

One Slotting Machine, 12 in. stroke, slots to the center of 46 in. Adjustable table and universal feed motion.

One Combined Power Punch and Shears, to punch 5/8 and 1/2, and shear 1/2 in. iron.

Three No. 2 Pratt & Whitney Milling Machines. Very good.

One No. 3 Pratt & Whitney Screw Machine, very good.

One Axle Lathe, Fitchburg Machine Co.

One 13 in. Shaper, Lowell Machine Shop.

One No. 1 Brown & Sharpe Screw Machine.

Two 4 in Spindle Drills.

One 3 Spindle Drill.

One Pond's double Miller.

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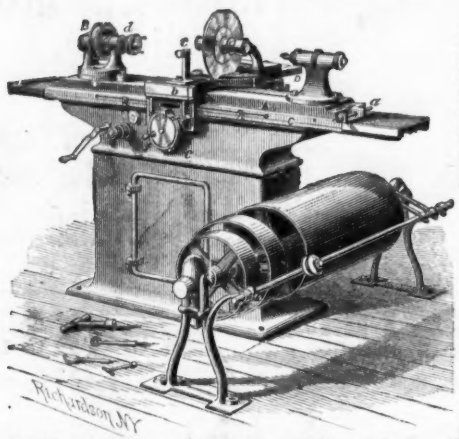
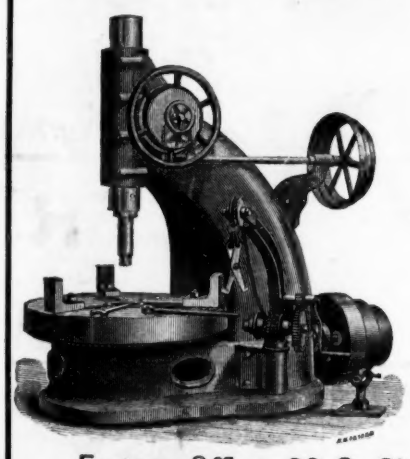
PATENT UNIVERSAL GRINDING MACHINE.



This Machine is arranged for doing a large variety of operations of grinding by the use of solid emery or corundum wheels. An additional movable table, capable of adjustment by a tangent screw and graduated arc, admits of straight and curved taper grinding with the centers of the machine always in line. It is specially adapted for grinding soft or hardened spindles, arbors, cutters, either straight or angular, reamers and standards, also for grinding out straight and taper holes, standard rings, hardened boxes, jewelers' rolls, &c. The work can be revolved upon dead centers or otherwise. The grinding wheel can be moved over the work at any angle, by which means any taper can be produced. Wheels from one quarter inch to 12 inches in diameter can be used either with or without water. The feed works and slides of the machine are covered and fully protected from grit and dust. The grinding of taper holes and angular cutters is provided for with graduated arcs. A special chuck for holding work to have holes ground, accompanies each machine. The spindle and boxes of the machine are of cast steel hardened and ground. Distance between centers, 28 inches; will swing 12 inches in diameter. The overhead works consist of a drum, tight and loose pulleys and adjustable hangers with self-oiling boxes. Countershaft should run 400 turns per minute. Tight and loose pulleys, 8 inches diameter, 4 inches face. Weight of machine, with overhead works, about 300 lbs. Illustrated Catalogue sent per mail on application.

CAR WHEEL AND AXLE

MACHINERY.



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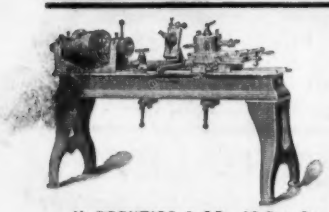

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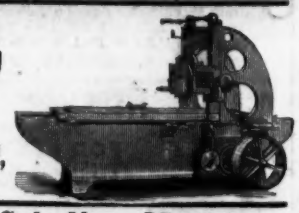

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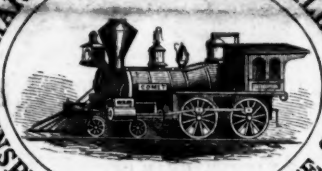

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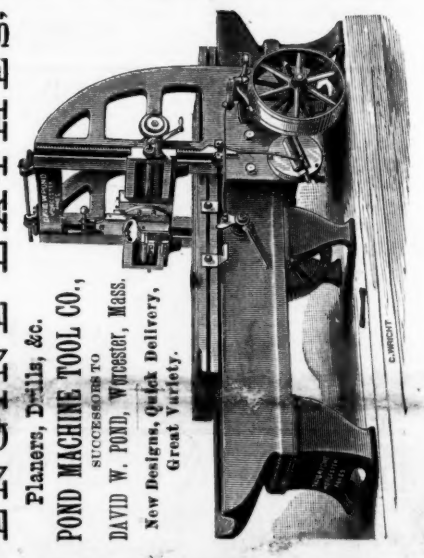

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